Visualizing HOPE: Encouraging HIV-Positive Organ Transplantation Using Novel Modular Animations

by
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Abstract

HIV+ candidates in need of organ transplantation face an increased risk of mortality while on the organ waitlist and decreased access to transplantation compared to HIV-uninfected (HIV-) candidates. Fortunately, HIV+ donor organs can now legally be transplanted into HIV+ recipients, thanks to the HIV Organ Policy Equity (HOPE) Act of 2013, which reverses an outdated ban and unlocks a pool of organs from an estimated 300-500 HIV+ deceased donors in the US annually. However, challenges in the current organ donation system and stigma against HIV present barriers to HOPE implementation and the potential for life-saving HIV+ donor to HIV+ recipient (HIV-to-HIV) organ transplantation. In collaboration with transplant surgeons, infectious disease healthcare providers, organ donation community consultants, and medical illustrators, a novel animation workflow was developed to create HOPE education materials. The animations, targeted to potential donors and recipients with HIV, healthcare providers, and professionals in the organ donation community are intended to promote awareness and ultimately increase the rate of HIV-to-HIV transplantation.

To efficiently communicate to these critical audiences, the animation process was streamlined by combining overlapping information into reusable components and addressing each audience with a customized call-to-action clip. The results of this project provide two individual animations addressed to (1) people living with HIV and (2) professionals in the organ donation community. The animations consist of reusable clips that explain the background information of the HOPE Act, the potential biological risks of HIV-to-HIV transplantation, and a concluding statement that reminds the viewer that their participation is essential to continue the success of the HOPE Act. Each animation concludes with an individualized call-to-action segment that inspires viewers to make a change.

By informing these critical audiences through inclusive and educational animations, this project aims to reduce stigma in HIV+ organ donor referrals and registration and to encourage participation in HIV-to-HIV transplantation.

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Introduction

HIV (Human Immunodeficiency Virus) is an RNA retrovirus that damages a person's immune system by leading to reductions in CD4+ immune cells. If not treated, an HIV infection can progress to Acquired Immunodeficiency Syndrome, or AIDS. During the acquired immunodeficiency syndrome (AIDS) epidemic in the 1980s, there was no effective treatment for HIV, which spreads through contact with specific body fluids, including blood products. In addition, HIV diagnoses were unreliable (Doby et al. 2018). As a result, acquiring organs for transplantation from those who were known or suspected to be living with HIV was banned as a protective measure (Doby et al. 2018). Fortunately, the life expectancy of people living with HIV has improved dramatically with advancements in antiretroviral therapy (**ART**), which has changed HIV from a fatal disease to a controllable, chronic condition (Boyarsky et al. 2015). Today, someone with HIV whose virus stays suppressed with continuous ART can live a long, healthy life and has effectively no risk of transmitting HIV.

Despite reductions in the number of AIDS-related deaths due to widespread use of effective ART, other complications such as end-stage renal disease and end-stage liver disease have increased proportionally as people with controlled HIV live longer (Durand et al. 2016). End-stage organ diseases often surpass opportunistic infections seen in advanced stages of HIV infection, and liver and kidney failure have become more prevalent causes of mortality in individuals with HIV (Campos et al. 2016). As a result, people living with HIV are increasingly in need of organ transplantation (Bansal et al. 2018).

Studies have demonstrated that patients with HIV who also have end-stage organ disease can receive organ transplants from donors without HIV, with outcomes comparable to those of HIV- transplant recipients (Durand et al. 2016). However, limited organ availability prevents transplant candidates with HIV from receiving an organ transplant (Bansal et al. 2018). Furthermore, patients with HIV in need of an organ transplant face decreased access to transplantation and a disproportionately higher risk of mortality while on the waitlist compared to candidates without HIV (Durand et al. 2016). Many patients living with HIV die each year while waiting for a lifesaving organ transplant (Boyarsky et al. 2015).

The HOPE Act

Successful organ transplantation from HIV+ donors to HIV+ recipients (HIV-to-HIV transplantation) has been encouraging in South Africa, where access to dialysis is limited, and HIV+ deceased donors provided a novel organ supply to support the greater need for transplants (Boyarsky et al. 2015). These cases demonstrated potential for adopting HIV-to-HIV transplantation practices in the United States (US) to combat the organ shortage. The HIV Organ Policy Equity (HOPE) Act, passed in 2013 reversed the outdated federal ban on the use of organs from HIV+ donors in transplantation and currently allows HIV-to-HIV transplantation under research protocols (Boyarsky et al. 2016). This important policy change unlocked a potential organ supply of an estimated 300-500 HIV+ deceased donors annually in the US and also allows people with HIV to become living organ donors (Segev 2019). Additionally, the HOPE Act has the potential of benefiting not only people living with HIV, but also HIV-uninfected individuals on the waitlist by expanding the donor pool overall. The policy changes introduced by the HOPE Act reflect the principle of equity: they expanded the organ donor pool to help those in need of an organ have more opportunities for a transplant, and they may even help to mitigate stigma associated with HIV (Durand et al. 2016).

The HOPE in Action study is the first multicenter study in the US to follow outcomes of research-mandated HIV-to-HIV transplantation from both living and deceased HIV+ donors. However, since the enactment of the HOPE Act in 2013, there have only been two living HIV+ donors and lower than expected numbers of deceased HIV+ donors. In contrast to the estimated potential of 300-500 HIV+ deceased donors per year, there were only 37 deceased HIV+ donors in 2019 (**Figure 1**).

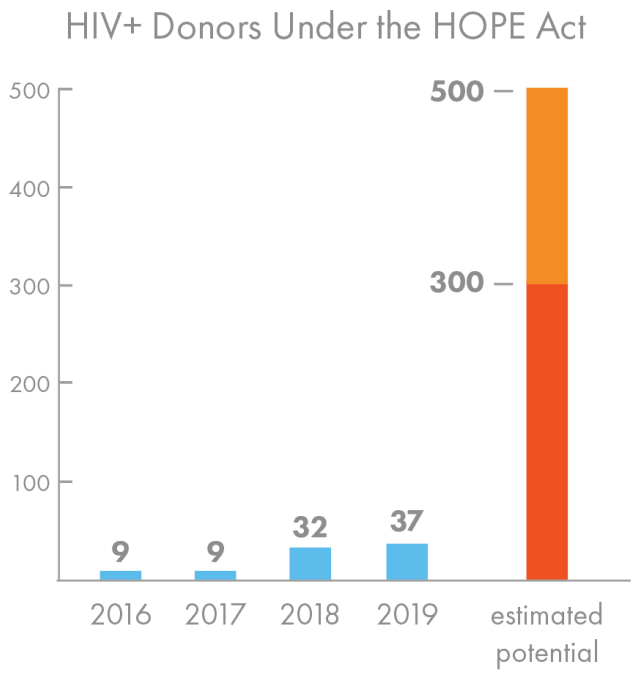

Figure 1. Deceased HIV+ donors under the HOPE Act between 2016 and 2019. There were 9 donors in both 2016 and 2017, with an increase to 32 donors in 2018, and 37 donors in 2019 (Segev 2019). Still, these numbers are lower than the estimated potential of 300-500 donors per year, which is shown on the right for comparison.

Challenges and barriers to HOPE implementation

Challenges in the current organ transplantation and donation system present potential barriers to the implementation of HOPE Act policy.

HIV stigma in donor referrals and registration

Unexpectedly low rates of HIV-to-HIV transplantation may be due to a lack of awareness in the public and incomplete implementation of the HOPE Act in the transplant system, as well as stigma against HIV in organ donor referrals and organ donor registration (Rasmussen et al. 2018). Prior to the HOPE Act in 2013, many people living with HIV did not register to become organ donors due to the ban on the use of organs from HIV+ donors in transplantation. In a survey taken at an HIV clinic in Baltimore, only 26% of participants were aware of the HOPE Act, and only 20% had registered to be organ donors (Nguyen et al. 2018). However, a surprising 62% of HIV+ participants were willing to become living organ donors, and 79% were willing to register

to become deceased donors (Nguyen et al. 2018).

Additionally, it is federally mandated that nurses at hospitals with trauma centers refer critically ill patients to their local Organ Procurement Organization (OPO) for organ donation. OPOs serve two major roles in their geographical service area: (1) They educate communities to encourage donor registration, and (2) When a patient is referred to an OPO by critical care hospitals, OPO representatives evaluate and screen potential donors, check the patient's state donor registry, discuss donation with the patient's families, obtain a candidate match list for that specific donor, and arrange for organ recovery and transport22. An unknown number of hospital staff are operating under the incorrect assumption that patients with HIV are not suitable candidates for organ donation based solely on their HIV status, and due to this lack of donor hospital education, an unknown number of referrals are missed between the hospital and OPOs. Similarly, if HIV+ patients are referred to an OPO for screening, OPO representatives may also have a preconceived stigma against HIV and declare HIV+ patients unsuitable donation candidates for that reason.

Biological risks

There are potential clinical risks related to HIV-to-HIV transplantation that could pose additional barriers to HOPE Act implementation (Boyarsky et al. 2015). One of the main biological risks related to transplantation of organs from HIV+ donors is **HIV superinfection**. HIV consists of a family of genetically different viruses, called strains. HIV superinfection can be defined as the transmission of at least one novel strain of the virus (not already present in the recipient) from a donor. Contracting multiple strains of HIV can occur with all modes of HIV transmission, including theoretically, receiving an organ from a donor with HIV (Smith et al. 2005). Having more than one strain of HIV is only clinically relevant if that strain cannot be suppressed by the individual's ART, or in other words, is drug-resistant to the particular ART regimen. HIV is prone to developing drug-resistance due to the rapid replication and error prone nature of the viral reverse transcriptase which introduces genetic mutations. Fortunately, there are multiple classes of HIV medicines available to control HIV. Different classes of ART allow HIV medicines to be interchanged to control an HIV infection following the development or introduction of a drug-resistant strain.

In the context of HIV-to-HIV transplantation, the recipient is exposed to the donor's strains of HIV and if this includes any drug resistant strains of HIV this could result in complications post-transplant if the recipient's ART is not active against that donor virus. If it is suspected that the donor has any drug resistance HIV, the recipient's ART may need to be altered post-transplant to control the infection. To assist clinicians in effectively targeting any new strains of HIV acquired through transplantation, the donor's history of treatment and potential drug resistance is reviewed and taken into consideration whenever possible.

Although ART resistance in the US is seen in up to 20% of newly infected individuals, multiclass resistant HIV is rare. In addition, recent studies from South Africa suggest that the risk of superinfection in an HIV+ recipient receiving ART is low (Selhorst et al. 2019).

Barriers to Transplant center involvement

In a study that surveyed 114 national transplant centers, 56% (n=64) of the surveyed centers were not planning to perform HIV-to-HIV transplants per the HOPE in Action research criteria, though most (91.2%) were aware that HIV-to-HIV transplantation is now legal. Furthermore, few centers plan to perform transplants of organs other than kidneys and/or livers (Rasmussen et al. 2018). There is also a geographical restriction of transplant centers, with more centers in the eastern US planning to adopt HIV-to-HIV transplantation protocols than in the central/western US (Rasmussen et al. 2018). This lowers the access of transplantation to patients with HIV, and OPOs may be less likely to refer patients with HIV for donation if the local transplant centers cannot use the organs.

The interest of hospitals in implementing HOPE Act policy might be expected to be low, as less than 1% of hospital services are related to organ transplantation. However, maintaining patients on the organ waitlist is an extremely costly burden to the entire healthcare system: Dialysis, the only existing alternative to kidney transplantation, costs the healthcare system an average of $28 billion every year ("Statistics." UCSF 2018). Furthermore, many centers have doubts regarding the efficacy of HIV-to-HIV transplantation. Centers not planning to implement HOPE Act protocol were more likely to believe that HIV+ candidates would be unwilling to accept organs from HIV+ donors, when in actuality, as mentioned earlier, studies suggest a high willingness among HIV+ candidates to accept organs from HIV+ donors (Rasmussen et al. 2018).

To access greater numbers of HIV+ donors and increase rates of HIV-to-HIV transplantation, further efforts are needed to inform and educate potential donors in the community of people living with HIV, nurses that recommend patients for organ donation, OPO representatives who screen donors, and national transplant centers of the biological risks and extensive benefits of HIV-to-HIV transplantation.

Existing outreach material

The methods for communicating HOPE Act policy and the potential for increasing life-saving HIV-to-HIV transplantation previously included the dissemination of brochures, lectures and interviews, and short messages through social media that were often less than effective at reaching or informing the target audience (**Figure 2** and **Figure 3**). While research has shown that using visual materials in addition to written materials can greatly increase patient understanding and retention of information (Weiss 2003), there is a need for more efficient, engaging, and persuasive visual communication to encourage participation in life-saving HIV-to-HIV transplantation.

Figure 2. Outreach material for people living with HIV. The purpose of this figure is to give examples of the educational outreach posters designed for people living with HIV (*not all text is intended to be read*).

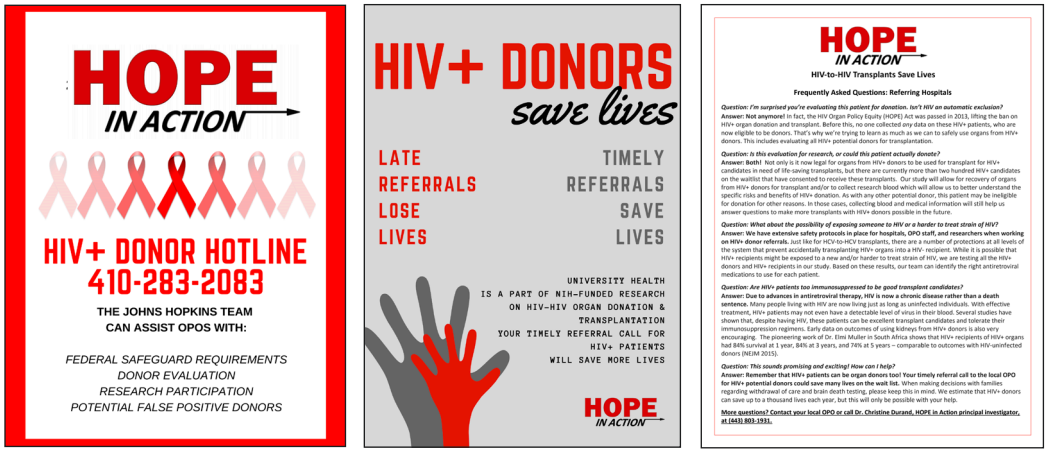

Figure 3. Outreach material for donor hospital nurses and OPO representatives. The purpose of this figure is to give examples of the outreach and educational FAQ posters designed for OPO representatives and nurses on referring HIV+ organ donors (*not all text is intended to be read*).

Audience: challenges and goals

We (the authors) identified several groups of people in the US that could benefit from educational outreach material to help increase rates of HIV-to-HIV transplantation (**Figure 4**).

1. People living with HIV
2. Nurses at hospitals with trauma centers and OPO representatives
3. Infectous disease care providers
4. Transplant centers
5. Patients with HIV in need of an organ

i. People living with HIV

As stated previously, only a minority of people living with HIV report being registered as organ donors. We hope to (1) alert people living with HIV that it is now legal to register to be an organ donor, (2) invite them to consider registering, (3) encourage them to inform their friends and family about their decision regarding organ donation, and (4) inspire them to spread the word about organ donation in the community of people living with HIV and elsewhere.

ii. Nurses at hospitals with trauma centers and OPO representatives

Another potential barrier to identifying HIV+ donors may stem from a lingering stigma against HIV affecting donor referrals by nurses and OPO representatives. Following education from HOPE outreach material, we hope nurses will make an informed decision to contact the OPO every time a potential donor presents, regardless of HIV status. We also hope that OPO representatives will likewise consider all referred patients for donation, regardless of HIV status. Through these changes, we hope to help reduce HIV stigma and remediate the impact of stigma in working with HIV+ potential donors at any point in the organ donation process.

iii. Infectious disease healthcare providers

Infectious disease healthcare providers interact with many patients with HIV. Therefore we hope to encourage these physicians to inform patients about the HOPE Act and make them aware that they can be organ donors.

iv. Transplant centers

To increase HOPE implementation at transplant centers, we will educate administrative and coordination staff at these centers of the policy change, address concerns about the efficacy of HV+ organ donation, and encourage them to adopt HIV-to-HIV transplantation protocols if they have not already done so.

v. Patients with HIV in need of an organ

HIV+ transplant candidates must give their consent before potentially accepting an organ from someone with HIV. The current methods for communicating the risks of receiving an HIV-infected organ consist solely of written materials developed for patients. We hope to educate potential HIV+ recipients about the safety and risks of receiving an organ from an HIV+ donor in a way that is engaging and easily understandable.

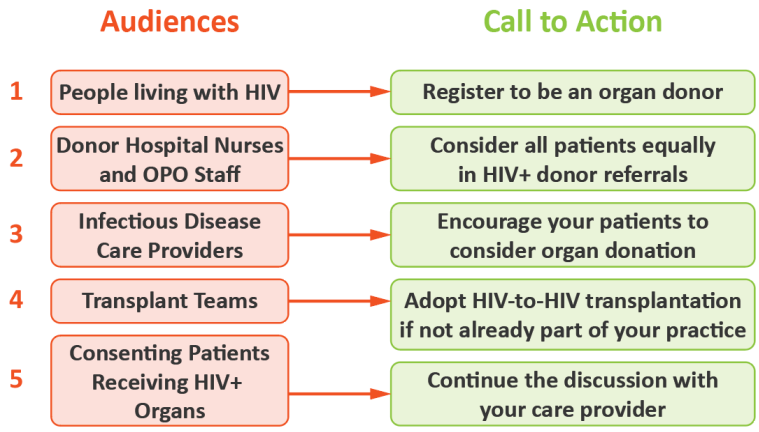

Figure 4. Potential audiences and calls to action. This graphic depicts the potential groups to address and the request for each.

Effectiveness of animation as a teaching tool

The rise of online communication has presented new possibilities to communicate information more attractively and with greater accessibility, especially for those with low health literacy. Information can be presented online in various modes of delivery, such as interactive graphics, videos, or animations (Meppelink et al. 2015). Animation has been perceived as an effective and engaging tool for disseminating complex information, with better learning

outcomes compared to static illustrations (Meppelink et al. 2015). Short and concise animations have been proven to enhance learning by simplifying complex, abstract science concepts and engaging the viewer with critical thinking and problem solving skills (Chan 2013). Furthermore, the effectiveness of educational visual animation is increased when coupled with audio commentary (Berney et al. 2016).

Effectiveness of animation in lower health literacy populations

Of the 1.1 million people aged 13 and older who were diagnosed with HIV in the United States in 2018, almost 70% are of Black/African American and Hispanic/Latino ethnicities ("Statistics Overview." Centers for Disease Control and Prevention 2019). Additionally, HIV diagnoses occur most commonly in individuals aged 20-29 but can also occur in older adults and children ("Statistics Overview." Centers for Disease Control and Prevention 2019). Lower health literacy is often common and problematic among older adults, ethnic minorities, and those with a lower level education (Nguyen et al. 2015). A lack of adequate, accessible communication of health information to multicultural minorities contributes to health disparities among these populations (George et al. 2013). Fortunately, communicating health related information via animation has been shown to improve the ability of audiences with lower health literacy to comprehend, understand, and ask questions about health information and research. Furthermore, enhancing understanding of health information can enable minority multicultural individuals to make educated decisions about their health and health research participation (George et al. 2013).

Communicating the governmental policy change following the HOPE Act and the safety and risks of HIV-to-HIV transplantation through engaging animations is expected to educate these audiences and provide the groundwork to inspire them to consider organ donation. Furthermore, this objective satisfies the frequent requests from OPOs for more materials to explain the HOPE Act policy change to hospital nurses in what is called "hallway education". Patient care can be deescalated when patients are not referred for potential organ donation; anecdotal data suggests critically ill HIV+ patients had been turned away by nurses before an OPO representative could discuss organ donation with the patients' families. Therefore, nurses often need additional tools to understand the policy change following the HOPE Act, and a brief animation for hallway education is expected to resolve this problem.

Theories of learning

Individuals with low health literacy often lack the background health information to fully understand the information presented in educational materials, and therefore are at risk of cognitive overload when presented with complex medical information (Meppelink et al. 2015). When designing an educational animated visual, it is imperative to implement learning theories to minimize cognitive load and maximize the learning outcomes for a specified audience.

The Cognitive Theory of Multimedia Learning declares three principles: (1) there are two channels for processing information: audio and visual, (2) people can only process a limited amount of information in each channel, and (3) learning is an active process of filtering and integrating information based upon previous knowledge (Mayer. 2012). For example, when played in conjunction, animated visuals and on-screen text are processed simultaneously, and the viewer must subsequently divide their attention between both. The modality principle suggests that learning is more effective when visuals are accompanied by audio narration versus solely on-screen text. However, select relevant words that appear on-screen simultaneously with narration utilize both audio and visual channels and promote active retention of information, as stated by the redundancy principle (Mayer. 2012).

To minimize cognitive load in these animations, the primary script information was delivered through audio narration, and on-screen text was minimized. Any on-screen labels were timed with the narration to boost retention through utilization of both audio and visual channels. Additionally, the contiguity principle suggests that learning is more effective when relevant information is presented closely together in visual space. Any on-screen labels of visual structures were placed in close proximity to the structures, or a leader line was used to directly pair the label to the structure for easier association and effective learning (**Figure 5**).

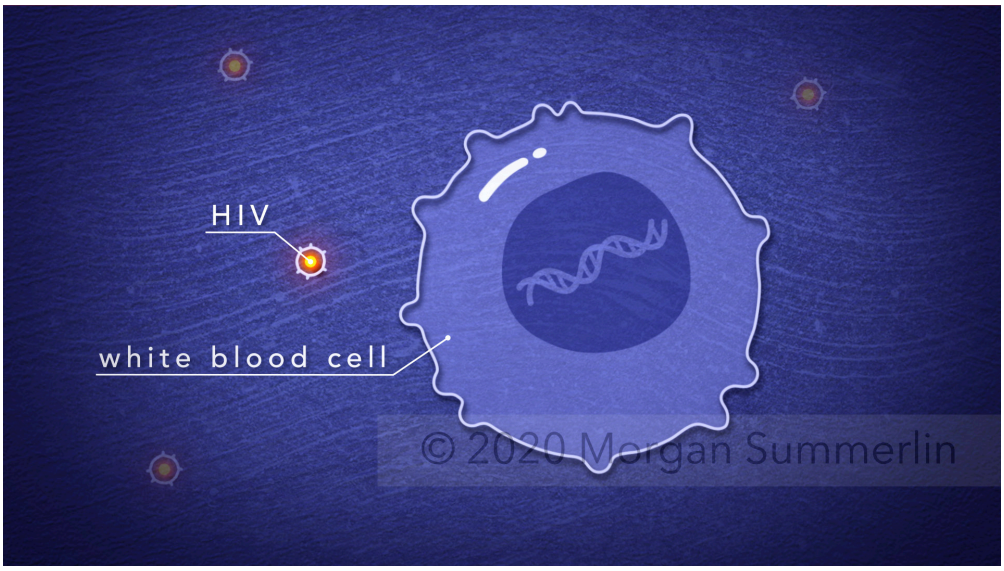

Figure 5. Redundancy and contiguity principles examples. This still from the animation shows examples of the redundancy and contiguity principles in action. These labels appear when mentioned in the narration, and in addition, they are directly connected to their associated structures with leader lines.

The personalization principle suggests that a narration with an informal and conversational tone conveys more of a social presence and helps to promote deeper learning. A voiceover artist with a gentle, reassuring voice was chosen to relate to the audience and engage the viewer in active, effective learning (Kurt 2011). Lastly, the learner control principle states that being able to control the rate of learning can help viewers learn more effectively. Communicating HOPE Act policy and the risks of HIV-to-HIV transplantation through animation provides the opportunity to incorporate this principle: when the animations are shared with the specified audiences, controls will be available to pause the videos for a self-paced learning experience.

Designing the content to be communicated

To efficiently create animations for the previously established audiences, we developed a workflow to create reusable animations that are tailored to each audience with customizable calls-to-action (**Figure 6**). To design the reusable clips that were to be unlocked for each audience, we identified the information that each group would benefit from learning to make an informed, educated decision about HIV+ organ donation and transplantation.

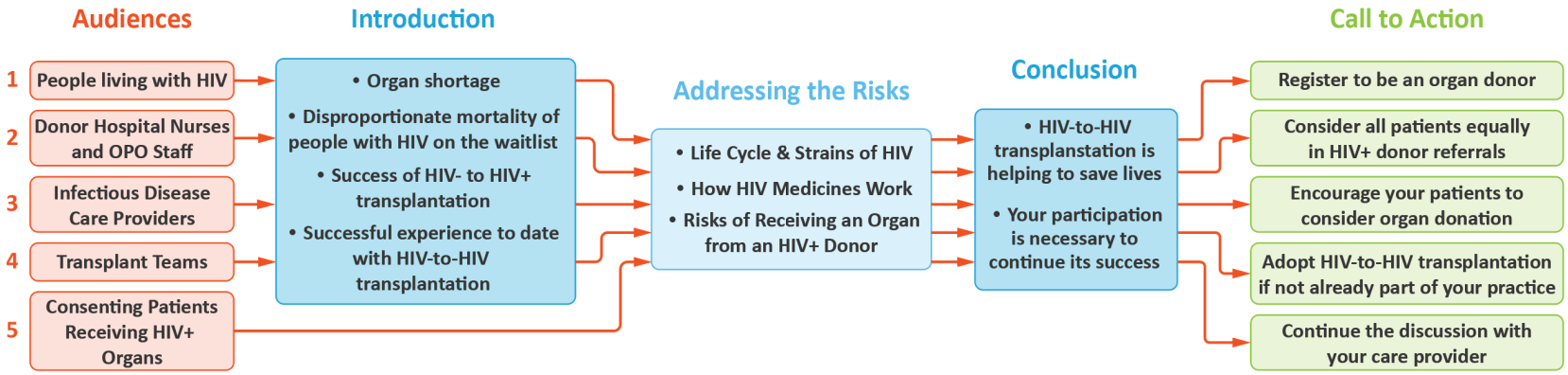

Figure 6. Flowchart of the clips to include for each prospective audience. This graphic depicts the audiences to address (red) and the clips to be included for each (blue and green). The Introduction, Addressing the Risks, and Conclusion clips are reusable for all audiences except for audience 5, "Consenting Patients Receiving HIV+ Organs," which did not receive the Introduction clip. Individualized Call to Action clips are tailored to each audience and not reusable between groups.

Introduction

Framing the issue by explaining the history of the HOPE Act will help viewers understand the social and historical impact of this important policy change. While most people are aware of the nationwide organ shortage, an explanation of the disparity of mortality rates on the waitlist could help contextualize the heightened risk HIV+ patients face while waiting for an organ. Additionally, the current state of organ transplantation for patients with HIV was described: for years, recipients with HIV had received organs from only HIV- donors, with equal long term success to recipients without HIV. This was followed by an introduction to the HOPE Act of 2013, which explained the early successful outcomes of HIV-to-HIV transplantation and revealed the substantial potential to increase the donor organ pool by making organs from people with HIV available for organ donation. Presenting these disparities and following with the feasibility and success of the HOPE Act laid the groundwork to delve into the science of how HIV-to-HIV transplants as well as the risks that are associated with them.

However, consenting patients considering receiving an organ from an HIV+ donor would already be aware of this legalization through their participation in the HOPE in Action research study. For the sake of brevity and to avoid redundancy, the background information clip was omitted for these consented patients.

Addressing the Risks

To address the concern regarding the safety and efficacy of HIV+ organ donation and HIV-to-HIV transplantation, the unique biological risks of HIV-to-HIV transplantation were discussed. While infectious disease healthcare providers are familiar with the genetic diversity of HIV, people with HIV may be less familiar with this principle. Therefore, a brief overview of the science of HIV would provide the proper background information for each audience to delve into the biological risks. The life cycle of HIV was first explained, followed by the ability of HIV to mutate and create unique strains before it infects other host cells to continue its life cycle. To reassure viewers, ART and its ability to control an HIV infection was explained. The great success of modern ART was described, as well as the shift of HIV to a controllable condition and the benefits on the long-term health of people with HIV.

This background information set the stage to introduce the main biological risk of HIV-

to-HIV transplantation: superinfection. While superinfection is not a characteristic unique to HIV, it is a relatively unfamiliar concept to patients and even healthcare professionals in other fields of medicine. Defining superinfection in the context of HIV-to-HIV transplantation would be beneficial information for each of the audiences—especially the HIV+ patients considering receiving an organ from an HIV+ donor, as the animation would be provided alongside the study consent paperwork that explains the risks. It is worth noting that the risk of organ rejection was not addressed, since it is pertinent to all organ transplantation, not just those involving HIV+ donors and recipients.

The aim of this clip is to address concerns about the unique risks of HIV-to-HIV transplantation and reassure viewers that the likelihood of these risks is low. By explaining these risks in the context of the science of HIV, this clip is expected to help alleviate concerns from transplant centers, hospital nurses, and OPO representatives, and hopefully also help mitigate stigma of HIV in these groups.

Conclusion

Additionally, each audience would benefit from a concluding summary that highlights the success to date of HIV-to-HIV transplantation and reinforces that their participation is essential to the future success of such transplants. This section also provides the opportunity to reassure patients and healthcare professionals that participation in HIV-to-HIV transplantation is worth the negligible risk of superinfection to HIV+ recipients compared to the high risk of dying on the waitlist.

Call to Action

Lastly, each animation concludes with a unique call-to-action that informs the viewers on how they can participate. These clips serve to encourage:

1. People living with HIV to consider registering to be an organ donor, to talk to their friends and family to make their decision about organ donation known, and to spread the word of organ donation in the community of people living with HIV and elsewhere.

2. Critical care nurses to consider all patients equally when referring patients to an OPO for screening, and OPO representatives to consider all patients equally when evaluating them for donation, regardless of HIV status.
3. Infectious disease healthcare providers to inform their patients with HIV of the legalization of using organs from HIV+ donors in transplantation, and to encourage their patients to consider registering to be an organ donor.
4. Transplant centers and teams to consider implementing HOPE Act policy and adopting HIV-to-HIV transplantation if it is not already in practice.
5. HIV+ patients who are consenting to receive an HIV+ donor organ to continue the discussion with their care providers.

Audiences addressed in this project

To create a realistic deliverable in the time allotted to this project, we distilled all of the potential audiences to the most essential groups where change would have the greatest impact and ultimately increase rates of HIV-to-HIV transplantation (**Figure 7**). As stated previously, we hypothesize that the largest loss of potential HIV+ donors stems from existing HIV stigma in donor referrals by nurses and OPO representatives. Another major barrier to identifying more potential HIV+ donors is the low rate of donor registration in the community of people living with HIV. Therefore, we decided to address (1) people living with HIV and (2) donor hospital nurses and OPO representatives specifically to reduce HIV stigma in donor registration, referrals and screening.

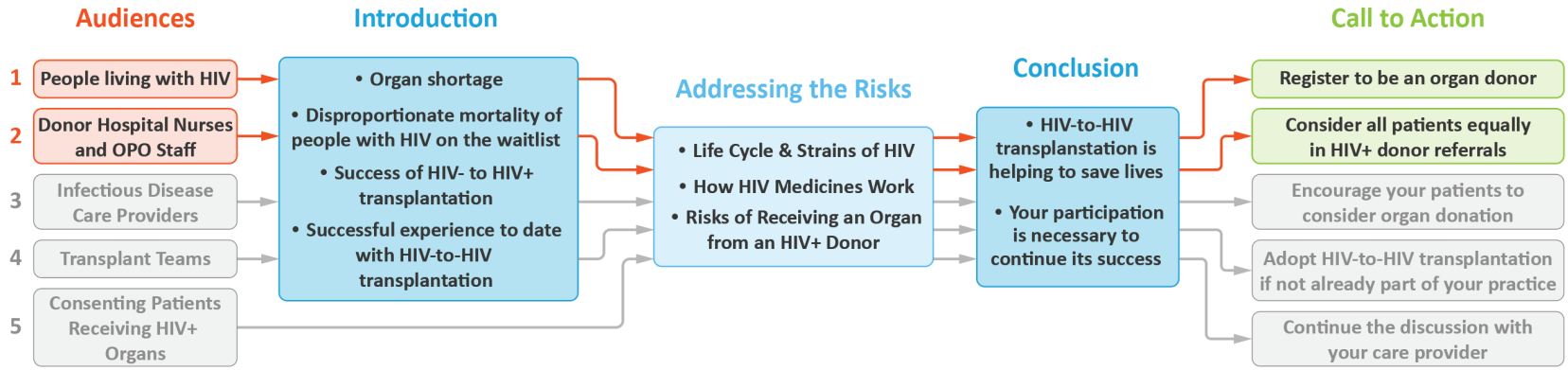

Figure 7. Flowchart of the clips to include for the two primary audiences. This graphic depicts the two primary audiences to address (red) and the clips to be included for each (blue and green). Both audiences received the Introduction, Addressing the Risks, and Conclusion clips, as well as a personalized Call-to-Action clip.

Script reading level for multiple audiences

While precise medical terminology is essential when communicating to healthcare professionals and those with a technical medical background, patients often do not grasp the intended meaning of this complex language, particularly those with lower health literacy. Reaching the target audience through plain language is vital in effective communication to patients ("Find Your Local Organ Procurement Organization." Health Resources & Services Administration 2020). Since both patients and healthcare providers were addressed in these reusable animations, we investigated diverging the script narration for the reusable clips into two versions: a descriptive script with exact medical terminology for nurses and OPO staff, and a simplified, streamlined script for patients with HIV that would be played over the same animated visuals.

However, after discussion with Dr. Durand, an additional role of the animations was identified. OPOs employ a variety of staff, including organ procurement coordinators, requesters, specialists who communicate with donor families, professionals in public relations communications and health education, as well as administrative personnel. While nurses caring for critically ill patients tend to have a high degree of medical knowledge, OPO representatives who evaluate patients for donation may not have the same level of medical knowledge to understand complex terminology.

Therefore, patient-level script language for nurses and OPO representatives would familiarize them with accepted HIV terminology and prepare them to work with patients with HIV. Although patients generally are found to have lower health literacy (Ishikawa et al. 2008), patients with HIV often have a higher level of understanding of HIV and their condition. It was therefore feasible to determine a level of information to reach both audiences and create a script that used medical terminology that people with HIV are comfortable with and that nurses and OPO representatives should become familiar with.

Objectives

The goal of this project was to create reusable animations with tailored calls-to-action that will help to increase awareness of the HOPE Act, help to mitigate stigma against HIV, and encourage participation in HIV-to-HIV transplantation. The objectives of this project include:

1. Create reusable clips and customized call-to-action clips for (1) people living with HIV and (2) nurses and OPO representatives.
2. Script and record the narrations for both audiences.
3. Combine clips and narrations to produce cohesive animations tailored for each audience.

The animations will educate people living with HIV, donor hospital nurses, and OPO representatives about the success of the HOPE Act and the risks of HIV-to-HIV transplantation. The animations are further expected to decrease HIV stigma in HIV+ donor referrals and encourage participation in HIV-to-HIV transplantation in these groups.

Materials and Methods

After identifying the target audiences for this project and determining the content to be communicated, the workflow for this project was as follows:

1. Script language and development
2. Voice Over production
3. Storyboard creation
4. Style development and animation
    - Style of science clips
    - Color Blindness test
5. Animation in Adobe After Effects

i. Script language and development

Following the approximate outline of content described earlier, a written narrative of the story was developed with language that is relative to and easily understandable by both audiences: people living with HIV and nurses and OPO staff. As previously mentioned, the script was composed at a level appropriate for patients with HIV, with simplified patient-friendly language and select medical terminology. In addition, awareness of patient-level terminology will help to prepare nurses and OPO representatives for effective patient communication.

To determine the appropriate medical terminology for patients with HIV for the scientific portion of the animation, I referenced the language used in a consent form (HOPE in Action Multicenter Kidney Study, 2019) for HIV+ candidates who are considering an HIV+ organ transplant. For example, the form contains a section titled "Risks and/or Discomforts" that presents risks to a patient receiving an organ from an HIV+ donor. The form introduces "HIV Superinfection," which is also the clinical term used by healthcare providers, and explains superinfection in a second person point of view, referring to the patient as "you" and donors as "HIV+ donors." However, some terms were softened for the intended patient audience: ART was referred to as "HIV medications," a strain of HIV is referred to as "a type of HIV," and drug-resistant HIV was referred to as "difficult-to-control HIV."

Following discussion with the consent form's author, Dr. Durand, some of these language changes were incorporated into the script. HIV superinfection is an important term that

is frequently referenced in HIV patient care, therefore, both audiences would benefit from becoming familiar with it . Similarly, HIV strain was used instead of "a type of HIV" to familiarize patients, nurses, and OPO representatives with the term. However, the more patient-friendly term HIV medicines was adopted instead of using ART since exact terminology is more important when explaining the transplant risks than when sharing scientific information about HIV.

In addition, since the individualized calls to action serve to encourage the viewer to take action, it was feasible to directly address each audience with a second person point of view and refer to the viewer as **you**. However, since two separate groups of people were addressed in the reusable clips, which serve to present information rather than persuade the viewer, second person point of view was not used when communicating to both audiences in these clips.

Furthermore, it is becoming common to use more courteous, person-first language when referring to people with an HIV infection. Throughout the script, individuals were referred to as **people living with HIV** rather than HIV+ individuals to reinforce the perception of HIV as a long-term, manageable, condition. This guideline also applied when referring to donors and recipients with HIV.

Keeping these concepts in mind, the script was developed following an iterative workflow with revisions by content experts. The final script was as follows:

Introduction

1. *Nearly 114,000 people in the United States are currently in need of an organ transplant.*
2. *Every day, over 100 people are added to the waitlist, and 20 will die having never received the lifesaving transplant they needed.*
3. *A growing number of those waiting are also living with HIV, and are more likely to die waiting for a transplant.*
4. *In the past, organs from donors with HIV were considered unsafe, and were banned from use in transplantation.*
5. *Historically, people with HIV received organ donations from people without HIV.*
6. *However, studies show that they can also receive organs from people with HIV, with*

equally successful outcomes.

7. *The HIV Organ Policy Equity Act, or HOPE Act, was passed in two thousand thirteen, and legalized transplanting organs from donors with HIV to people who also have HIV.*
8. *Thanks to the HOPE Act, people in need of an organ are more likely to receive a transplant:*
9. *Transplanting organs between donors and recipients with HIV provides more organs for people without HIV, and creates more life-saving transplants every year.*

Addressing the Risks

Life Cycle and Strains of HIV

1. *How is it possible that patients with HIV can receive organs from donors who also have HIV?*
2. *HIV is a virus that primarily infects the body's white blood cells.*
3. *The virus enters a host cell, where it makes copies of itself using the host cell's machinery.*
4. *As it replicates, HIV has the ability to mutate and change over time, which creates unique strains of HIV that can differ from person to person.*
5. *The virus then leaves the cell to locate a new host and continue its life cycle.*

How HIV Medications Work

6. *HIV medicines work by blocking replication and preventing the spread of HIV to other cells, which minimizes levels of HIV in the body.*
7. *Decades of research into HIV medicines has allowed HIV to become a controlled condition rather than a deadly disease.*
8. *However, when HIV mutates it can become resistant to medication.*
9. *Fortunately, there are multiple classes of HIV medicines that block HIV replication in different ways.*
10. *If HIV becomes resistant to one class of medicines, others can be substituted to control an HIV infection.*

Risks of Receiving an Organ from a Donor with HIV

11. *When someone with HIV is given an organ from a donor with HIV, new strains of the virus can be introduced with the organ.*
12. *Fortunately, the recipient's current HIV medicines are likely to control the new strains from the donor.*
13. *However, the recipient could become infected with the new strains, in addition to their existing HIV infection. This is called superinfection.*
14. *If superinfection occurs, different HIV medicines will be tried until an effective new combination is found.*
15. *Fortunately, studies show that the risk of superinfection is low, compared to the greater risk of dying while waiting for an organ.*

Conclusion

1. *Organ transplantation between donors and recipients with HIV is an important step towards shortening the waitlist for organ transplants.*
2. *Under the HOPE Act, 500-600 new donors are expected to be available in the US annually, and up to 10,000 people with HIV could benefit from this change.*
3. *Your support and participation can help maximize these life-saving transplants*

Call-to-action: Register to be an organ donor

People living with HIV

1. *We ask that you consider registering to be an organ donor, because that one decision could save lives.*
2. *Register at the DMV or online at registerme.org, and talk to your friends and family to make your decision about organ donation known.*
3. *You do not have to disclose your HIV status in order to register.*
4. *We also ask that you help raise awareness of the importance of organ donation in the community of people living with HIV to continue these life saving transplants.*

Call-to-action: Consider all patients equally in HIV+ donor referrals

Donor hospital nurses and OPO representatives

1. *When referring a patient for organ donation, HIV status should not change your perception of your patient's potential to save lives.*
2. *Patients can be newly diagnosed with HIV, in care for HIV, or potentially HIV-positive pending serological testing.*
3. *Even if a patient has never been in care for HIV, they still have the potential to save lives.*
4. *The HOPE Act does not require disclosure of HIV status to the patients' families in order to be an organ donor.*
5. *When an OPO receives a call about a potential donor with HIV, they can contact the HOPE in Action study at Johns Hopkins, for assistance with clinical evaluation, approach, and organ allocation.*

ii. Voice over production

As stated previously, the personalization principle of the Cognitive Load Theory suggests that an informal and conversational tone of narration conveys a social presence and helps to promote deeper learning. Additionally, the signaling principle states that pauses in narration can help the viewer learn more efficiently by signaling and emphasizing important aspects of the provided information (Mayer 2014).

The voice over narration was recorded by Andy Zeiger, whose voice is warm, clear, and animated. Under my direction, he accented specific, important words with inflection and varied the pitch of his voice to create a flowing sentence structure. Select pauses were accentuated to emphasize important information. The goal of the narration was to inform the viewer by means of a clear, conversational voiceover that the viewer can understand and relate to.

iii. Storyboard creation

A storyboard can be referred to as the first visualization of the story (Wright 2013). Using the script as a guide visuals are proposed to assist and clarify the content. The storyboard serves multiple purposes in the animation process. It helps to: (1) give a visual outline of the animations, (2) determine the number of assets needed, (3) determine the length and timing of scenes when the script is incorporated, and (4) establish a visual style to serve as a guide for asset creation.

Multiple iterations of the storyboards were developed following feedback from content experts, and the script underwent many changes as the visuals developed (**Figure 8**; **Appendix A**).

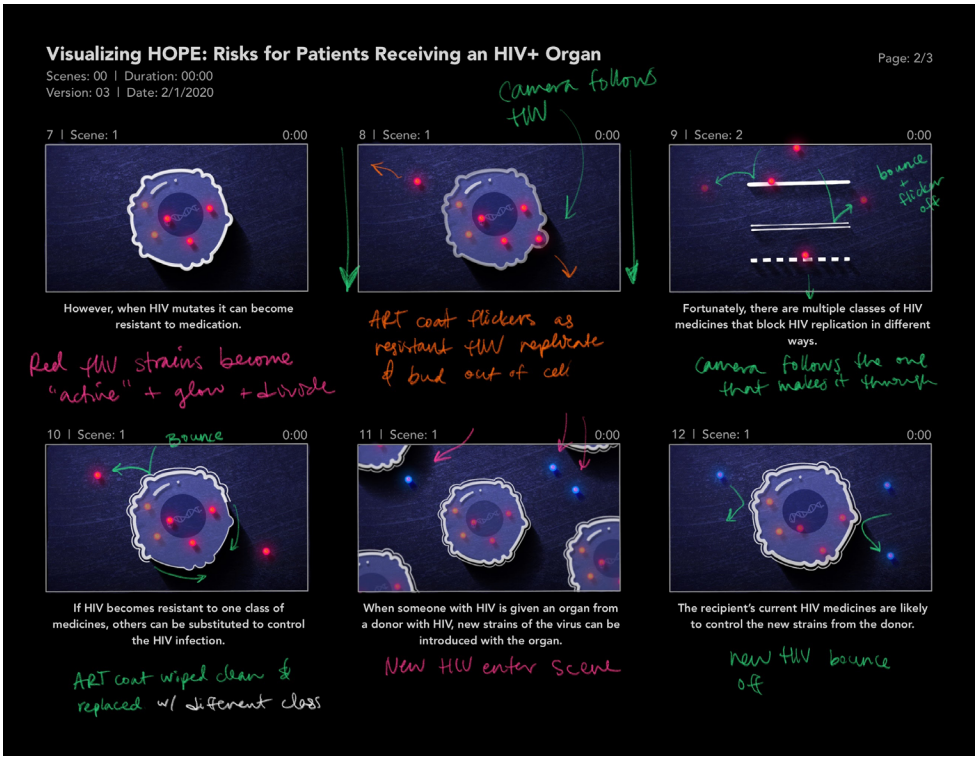

Figure 8. Selected storyboards from the Addressing the Risks clip. This figure shows an example of the storyboards created for this project (*text not intended to be read*).

iv. Style development and animation

When visualizing organ transplantation to both target audiences, a human figure was considered to depict the transplanting of organs between donors and recipients. However, the goal of this project was to create welcoming and relatable educational material that (1) promotes inclusivity in the community of people living with HIV and (2) helps to mitigate any HIV stigma stemming from preconceived bias in HIV+ donor referrals. Since the viewer might be expected to subconsciously associate a human figure with themselves or others, an alternative visual was developed to represent recipients and donors with and without HIV.

A visual system was established to differentiate these individuals without using a human figure. Individuals were identified with contrasting shapes and colors as shown in **Figure 9**. All HIV- individuals were represented with a circle, and HIV+ individuals were represented with a diamond. HIV- recipients were blue, HIV+ recipients were a contrasting orange, and all organ donors, regardless of HIV status, were depicted with white.

Additionally, this identification system was also applied when referring to people on the waitlist who have died waiting for an organ transplant. A new style was developed for these individuals, also seen in **Figure 9**. Deceased HIV- patients were depicted with blue circles, and HIV+ patients were depicted with orange diamonds.

Furthermore, giving life to an individual with an organ transplant was conveyed through a metaphor of light, and transplantation was depicted as transferring light from a donor to a recipient. Hollow symbols depicting patients in need of a transplant were illuminated and filled in after receiving an organ transplant from a donor (**Figure 10**).

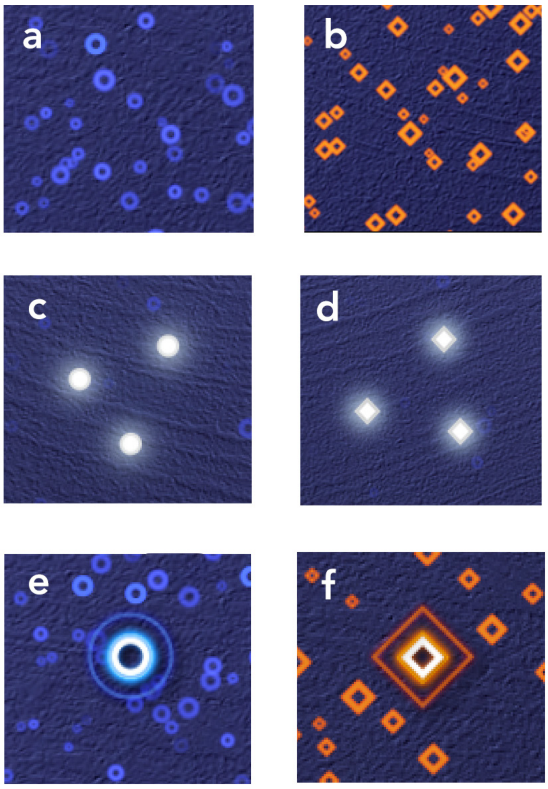

Figure 9. Established system to identify donors and recipients with and without HIV. All HIV- individuals were represented with a circle (a, c, and e), and HIV- individuals were represented with a diamond (b, d, and f). (a) HIV- patient on the waitlist, (b) HIV+ patient on the waitlist, (c) HIV- organ donor, (d) HIV+ organ donor, (e) deceased HIV- patient, and (f) deceased HIV+ patient.

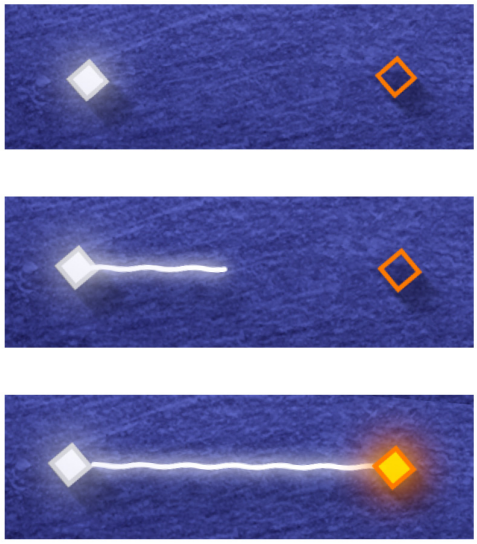

Figure 10. Organ transplantation between donors and recipients. Example frame sequence from the final animation showing the visual for organ transplantation between an HIV+ donor (left) and an HIV+ recipient (right).

As stated previously, the redundancy and contiguity principles suggest that retention of information is increased when select words from the audio appear on-screen in conjunction with the narration, and when related structures and labels are placed in close proximity (Mayer 2012). For easier understanding of the previously mentioned donor/recipient identification system, labels were used to call out each representational visual as they appeared in the animations, and leader lines were used to associate them with the correct structures (**Figure 11**).

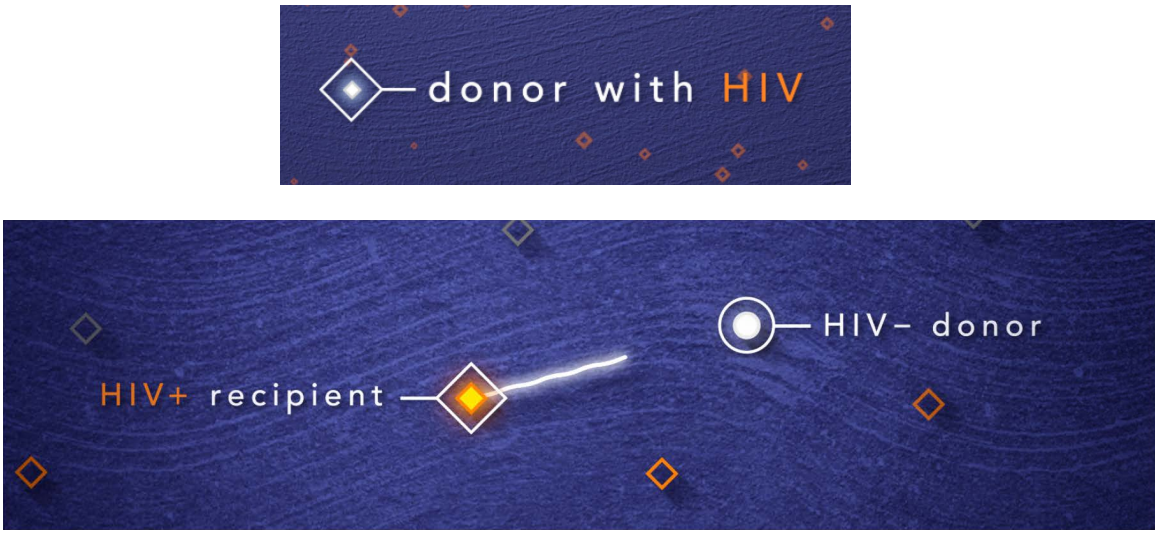

Figure 11. Labeling to identify HIV+ and HIV- donors and recipients. Example of the labels used to identify an HIV- donor and an HIV+ recipient from the final animation.

Style of science clips

A clear and effective style of animation was developed to communicate complex scientific topics such as HIV superinfection to the target audiences. Furthermore, since one of the audiences consisted of a patient group, a simplified depiction of cellular and viral mechanisms was used (**Figure 12**). Hyper-realistic rendering of such mechanisms would provide an unnecessary and potentially distracting amount of detail, which could increase cognitive load in a patient audience and hinder effective learning.

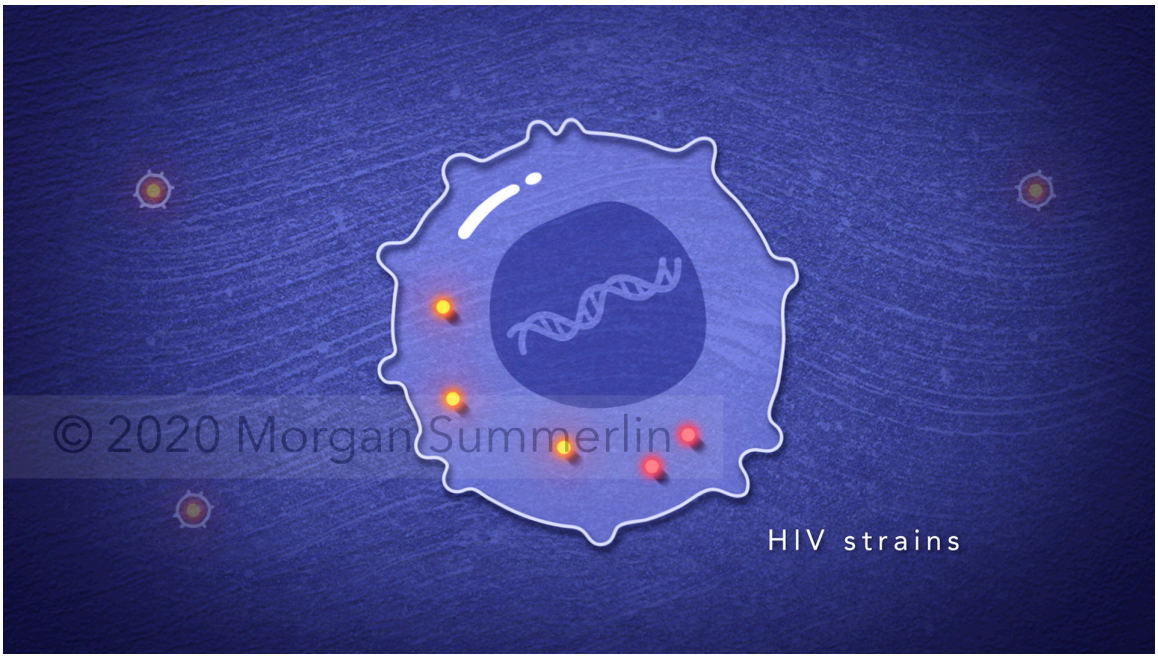

Figure 12. Style of science clips. An example still from the final animation showing the simplified style of science communication to explain topics such as the development of HIV strains within a white blood cell host.

Color Blindness Test

Since the established color system was important to differentiate donors and recipients with and without HIV, the resulting style was tested for individuals with colorblindness using an online simulator. A frame from the final animation was tested in red-weak/protanomaly, green-weak/deuteranomaly, blue-weak/tritanomaly, red-blind/protanopia, green-blind/deuteranopia, blue-blind/tritanopia, monochromacy/achromatopsia, and blue cone monochromacy individuals (**Figure 13**).

Figure 13. Color blindness test. Still frame from the introduction to test for the usability by color blindness individuals. (a) normal, (b) red-weak/protanomaly, (c) green-weak/deuteranomaly, (d) blue-weak/tritanomaly, (e) red-blind/protanopia, (f) green-blind/deuteranopia, (g) blue-blind/tritanopia, (h) monochromacy/achromatopsia, and (i) blue cone monochromacy.

v. Animation in Adobe After Effects

The final artwork assets were created in Adobe After Effects. A clean, simplified 2D style was developed to create a time-efficient and easy to follow animation. However, drop shadows (**Figure 14**) and texturizing techniques (**Figure 15**) were used with consistent light direction to create the appearance of a 3D animation with extruded shapes and floating linework.

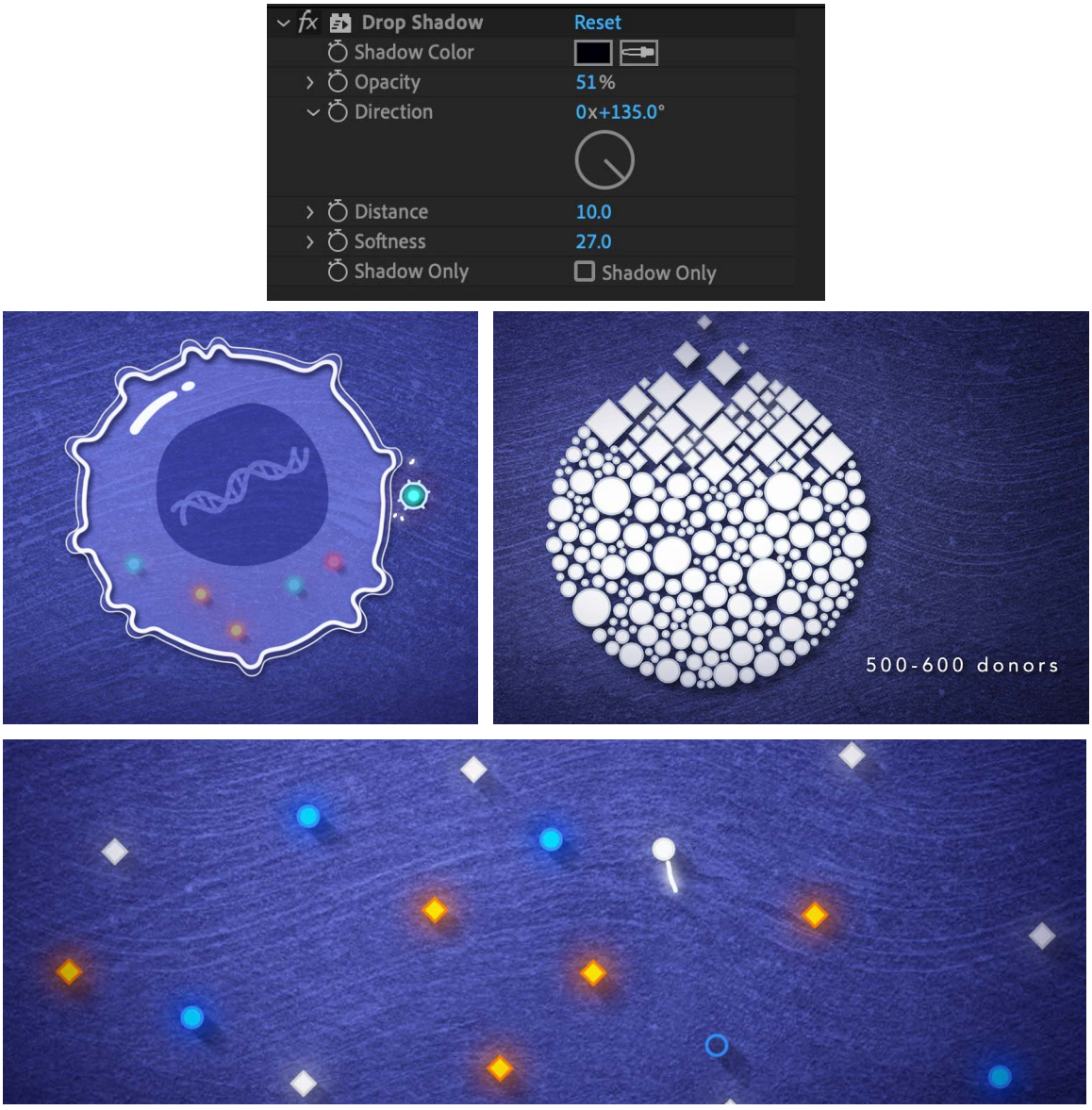

Figure 14. Drop Shadow effect. These figures show the application of drop shadows to add 3-dimensionality to 2D artwork. The direction of shadows is kept consistent throughout the animations to give the appearance of more realistic lighting (*not all text intended to be read*).

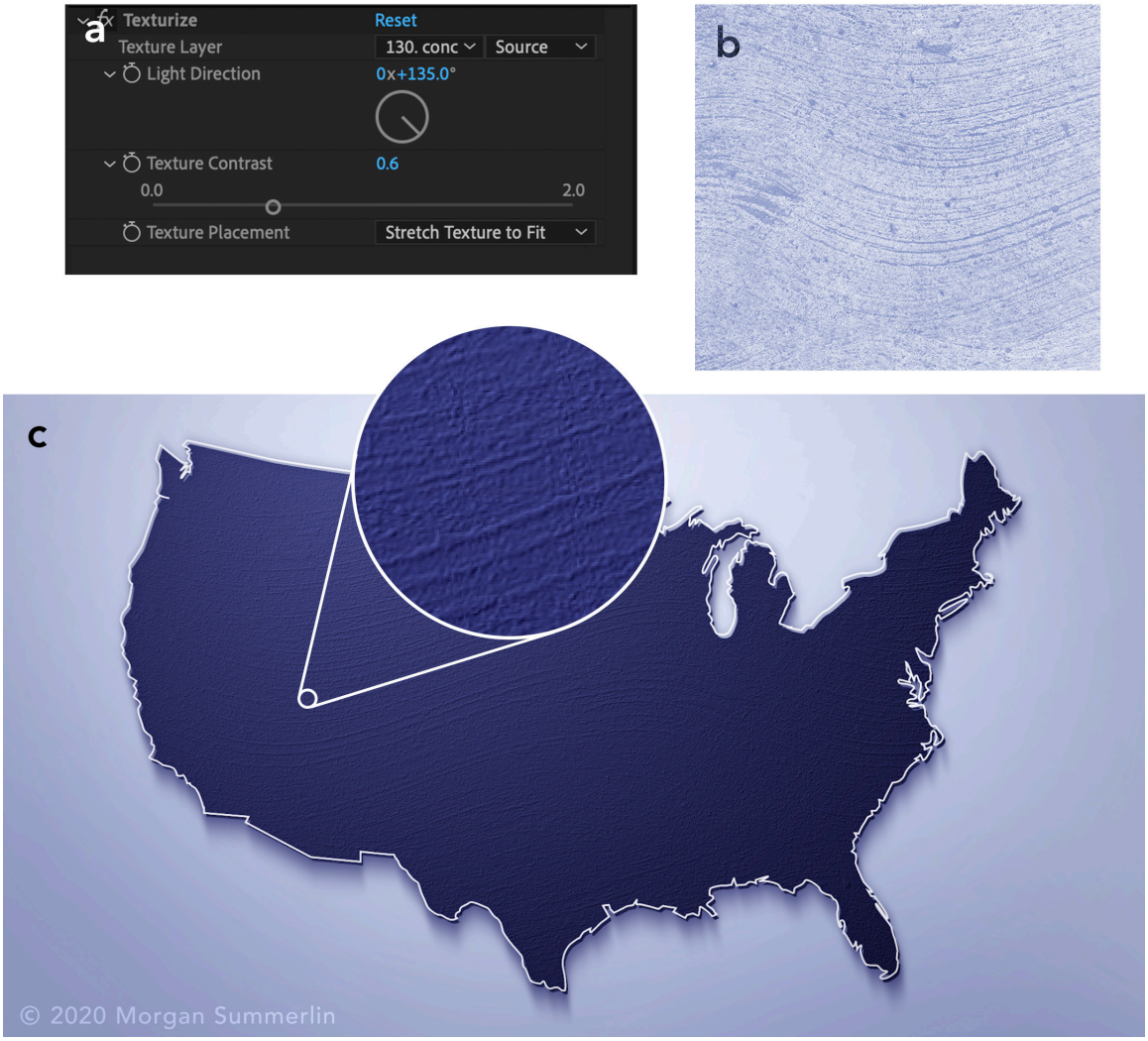

Figure 15. Texturize effect. This figure describes adding texture to a 2D layer in After Effects. The texturize effect (a) creates the illusion of surface topology using a selected layer and light direction. The source layer (b) was a flat image created from a texture brush in Procreate to create the final textured result (c).

During the Addressing the Risks clip, the Puppet Position Pin Tool was used to add organic movement to the relatively static host cell. Pins were placed around the cell membrane and manipulated slightly throughout the timeline to give the appearance of a wave-like movement (**Figure 16**).

Furthermore, to create the illusion of a malleable cell membrane that reacts to physical forces, specific movements were keyframed with the Puppet Position Pin Tool. When the HIV virion pressed against the host cell, the host cell membrane stretched inwards slightly before recoiling quickly after the viral membrane merged with the host cell and the HIV RNA was inserted into the cell (**Figure 17**).

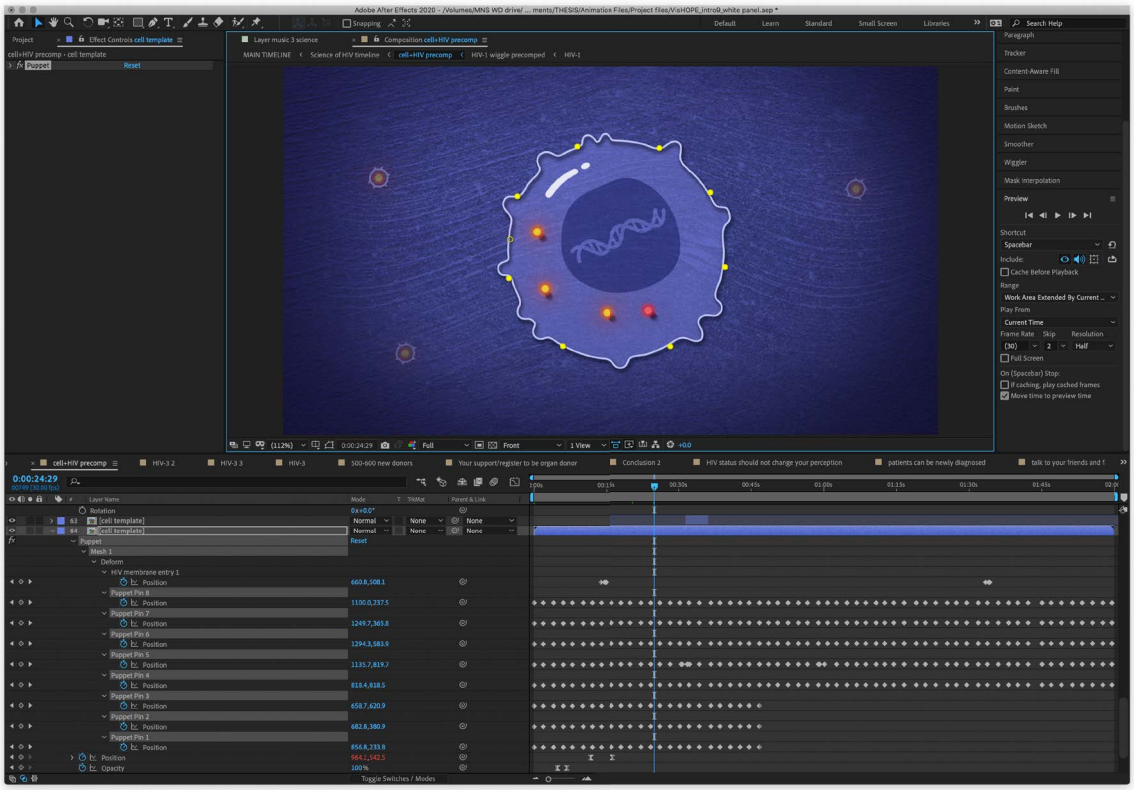

Figure 16. Puppet Position Pin Tool for organic movement. This figure shows the location of the 8 puppet pins used to add organic movement to the host white blood cell (*not all text intended to be read*).

Addition of the Wiggle expression added subtle movement to the HIV virions throughout the clip (**Figure 18**). The Wiggle expression was used with both positional and rotational directions for more dynamic movements. In addition, the Wiggle expression was also included in the position and rotation movements of the entire Addressing the Risks clip to mimic a camera shake and to give the impression of a dynamic cellular environment.

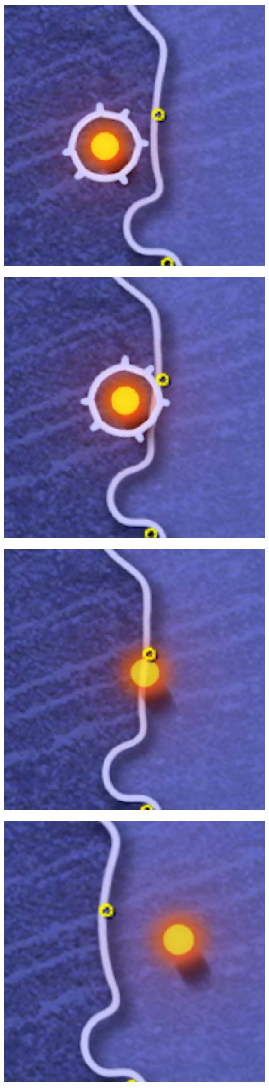

Figure 17. Puppet Position Pin Tool for organic movement. These figures show the deformation of the host cell membrane to give the illusion of a malleable and elastic membrane during HIV entry. Extracellular space is to the left of the membrane and intracellular space is to the right.

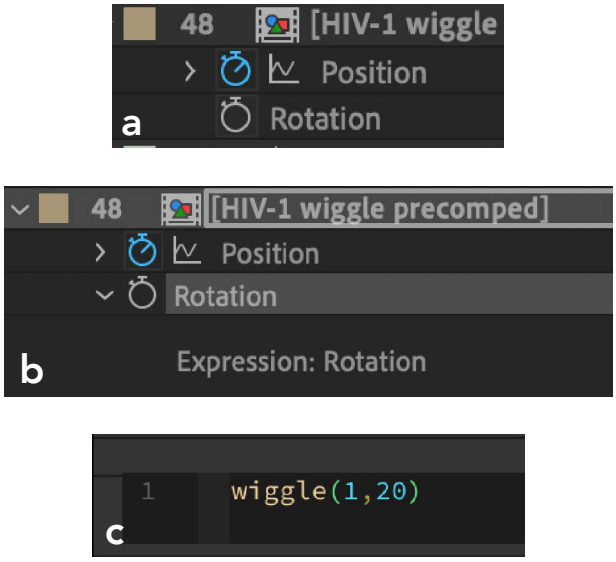

Figure 18. Opening the Expression dialogue box. After opening the position or rotation drop-down menus on a layer (a), the stopwatch is clicked while pressing the Alt-Option key on a Mac to open the Expression dialogue box (b). The wiggle expression (c) is then entered to provide random movements, which can be controlled by the values within the parentheses.

Results and Discussion

In total, two standalone animations were created in this project that address two distinct audiences: (1) people living with HIV and (2) nurses at hospitals with trauma centers and OPO representatives. The animations were created from reusable introduction, body, and conclusion clips as well as call-to-action clips that were customized to each audience. The narration was simplified to a level of complexity for patients with HIV, to better prepare hospital nurses and OPO staff for communicating important concepts with patients.

The final animation for people living with HIV resulted in a video file 4 minutes and 22 seconds in duration (4 minutes and 11 seconds without credits). The final animation for nurses and OPO representatives resulted in a video file 4 minutes and 37 seconds in duration (4 minutes and 26 seconds without credits (**Appendix B**). In addition to the final animations, 3 sets of storyboards were developed in preparation for the animations (**Appendix A**).

Changes during the project

The identification system established in the storyboards was changed during production to further help the viewer identify donors and recipients with and without HIV. Individuals with HIV were differentiated from those without HIV using diamonds rather than only circles for both groups as originally planned. Furthermore, labels were added throughout the animation to increase understanding of the on-screen structures.

Project objectives

The primary goals of this project were to create two reusable animations with tailored calls-to-action that will educate people living with HIV, donor hospital nurses, and OPO representatives about the success of the HOPE Act and the risks of HIV-to-HIV transplantation. In addition, the animations were also expected to decrease HIV stigma in HIV+ donor referrals and encourage participation in HIV-to-HIV transplantation in these groups.

Future considerations

Future directions for this project involve completing the Call-to-Action clips for the three remaining audiences not addressed in this portion of the project. Since HIV superinfection in the context of organ transplantation is a frequently misunderstood topic, the "Addressing the Risks" clip should be turned into a standalone animation to be presented by Drs. Dorry Segev and Christine Durand in their lectures to their clinical colleagues in the fields of organ donation and transplantation.

In addition, the animation for transplant hospital nurses and OPO staff will be presented at HIV clinics and future annual meetings for: Association for Organ Procurement Organizations, Organization for Transplant Professionals, and Association of Nurses in AIDS Care.

Furthermore, the effectiveness of the learning content created during this project is yet to be tested. For future study, a pre- and post- test may be administered to a random group of individuals from each intended audience, and statistical analyses used to evaluate the effectiveness of the animations in reaching the previously listed objectives.

Access to thesis animations

The final animations from this thesis can be viewed at **morgansummerlin.com** or by contacting the author through the website's contact form. The author may also be reached through the Department of Art as Applied to Medicine via the website **medicalart.johnshopkins.edu.**

Appendix A: Storyboards

Reusable Clips Storyboards for Animations 1 and 2

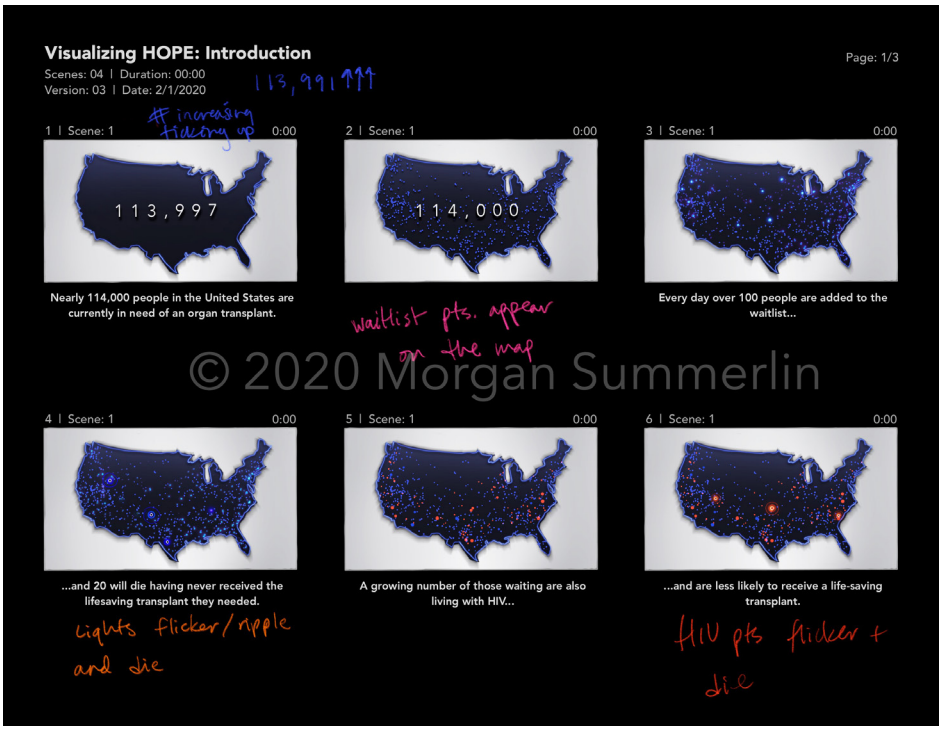

Figure 19.1. Storyboard 1 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

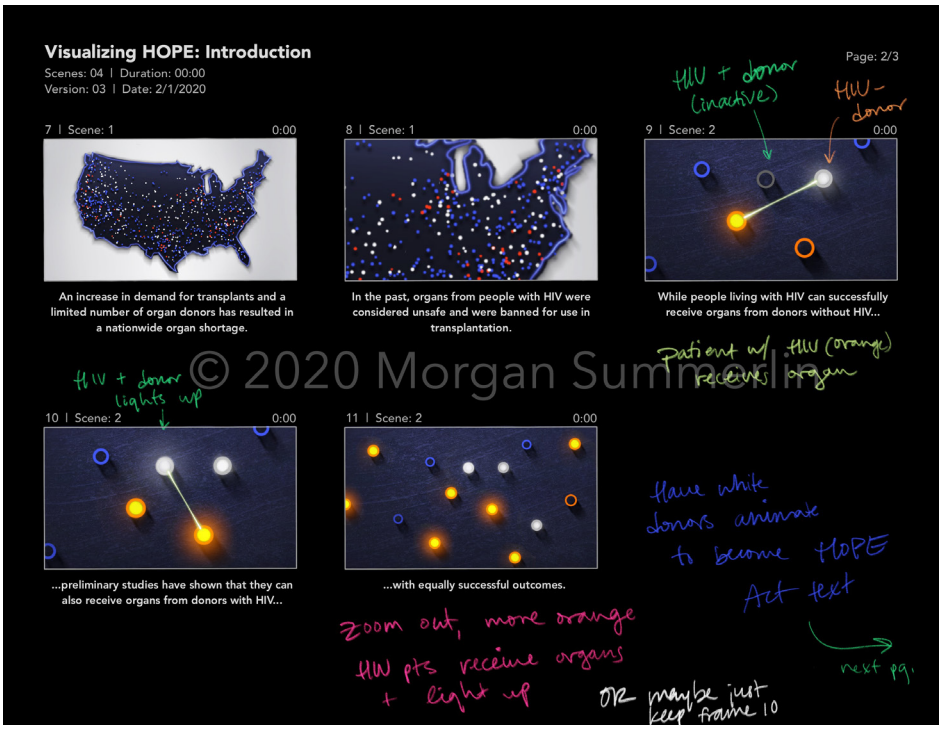

Figure 19.2. Storyboard 2 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

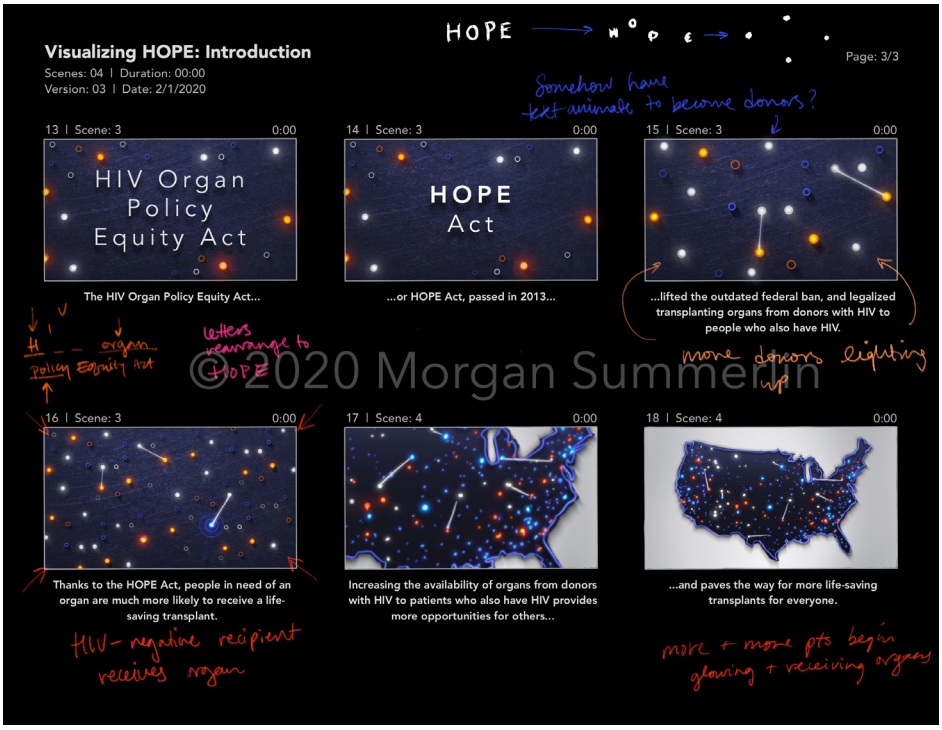

Figure 19.3. Storyboard 3 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

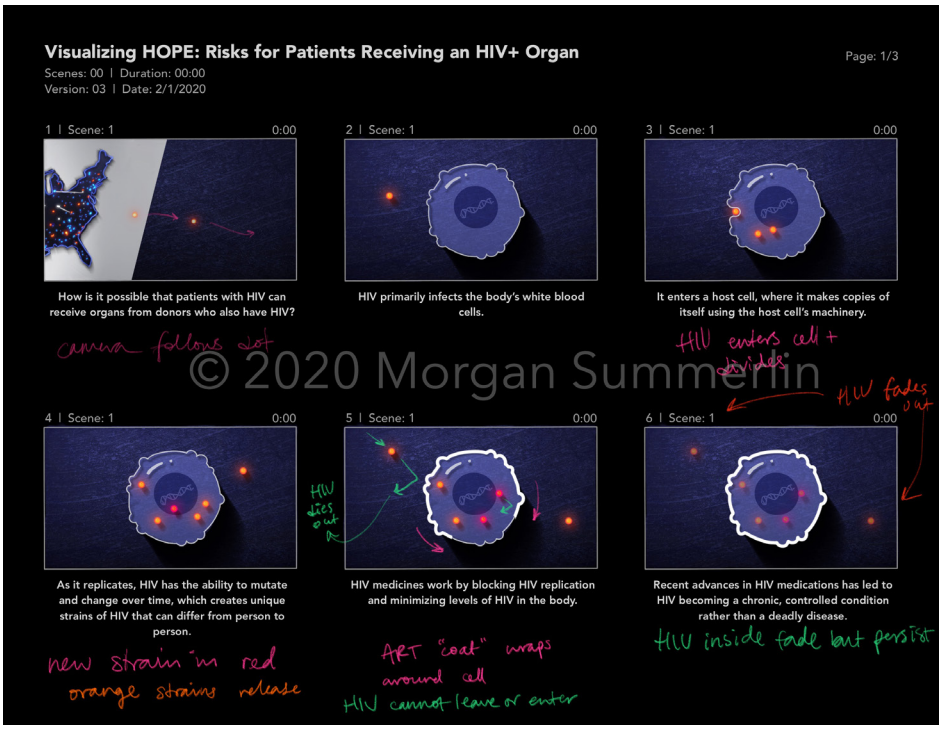

Figure 19.4. Storyboard 4 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

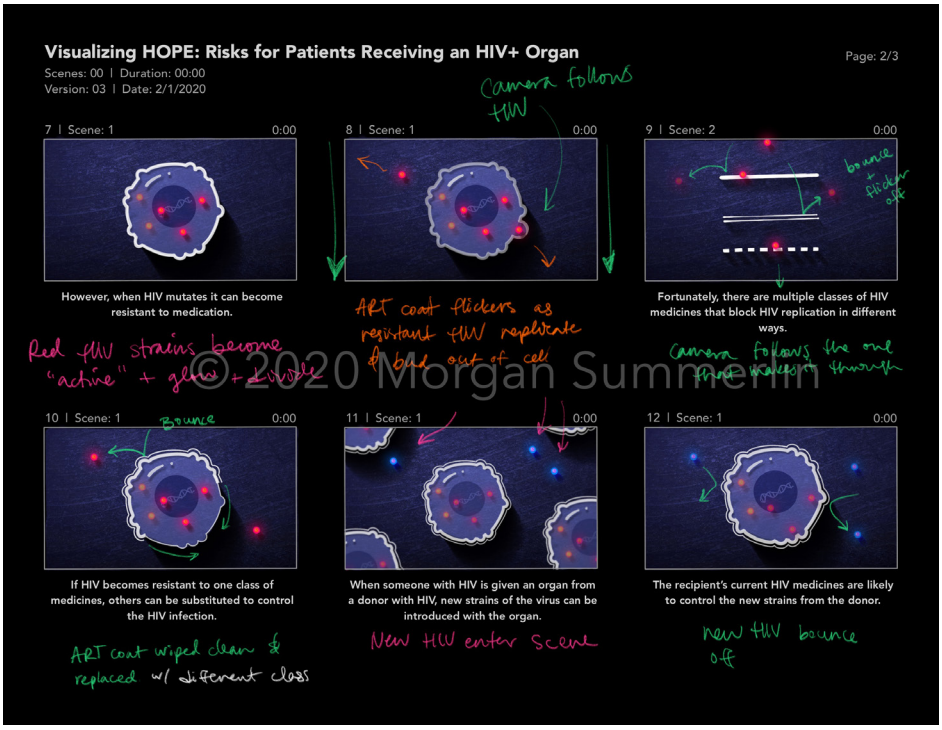

Figure 19.5. Storyboard 5 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

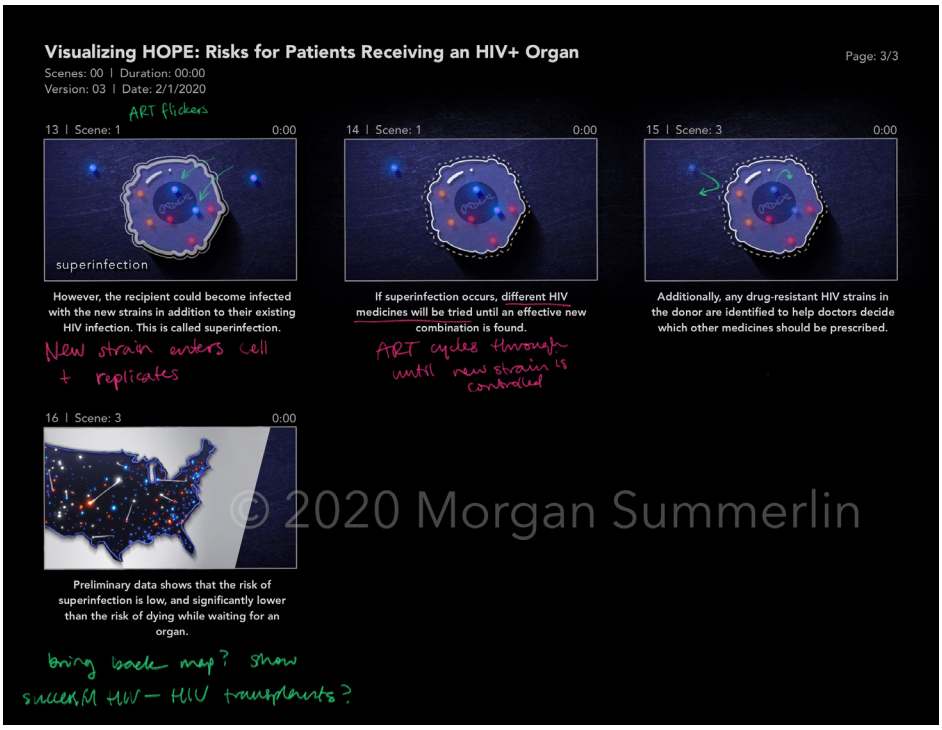

Figure 19.6. Storyboard 6 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

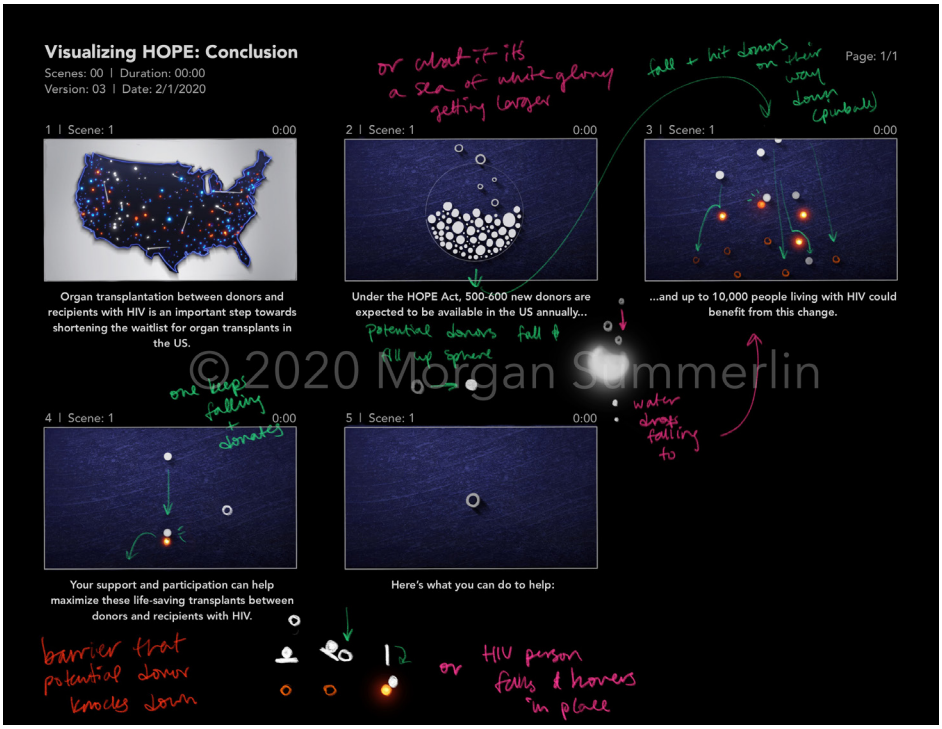

Figure 19.7. Storyboard 7 for Animations 1 and 2. Storyboard frames for the reusable components for both animations (*text not intended to be read*).

Call-to-Action Storyboard for Animation 1:

People living with HIV

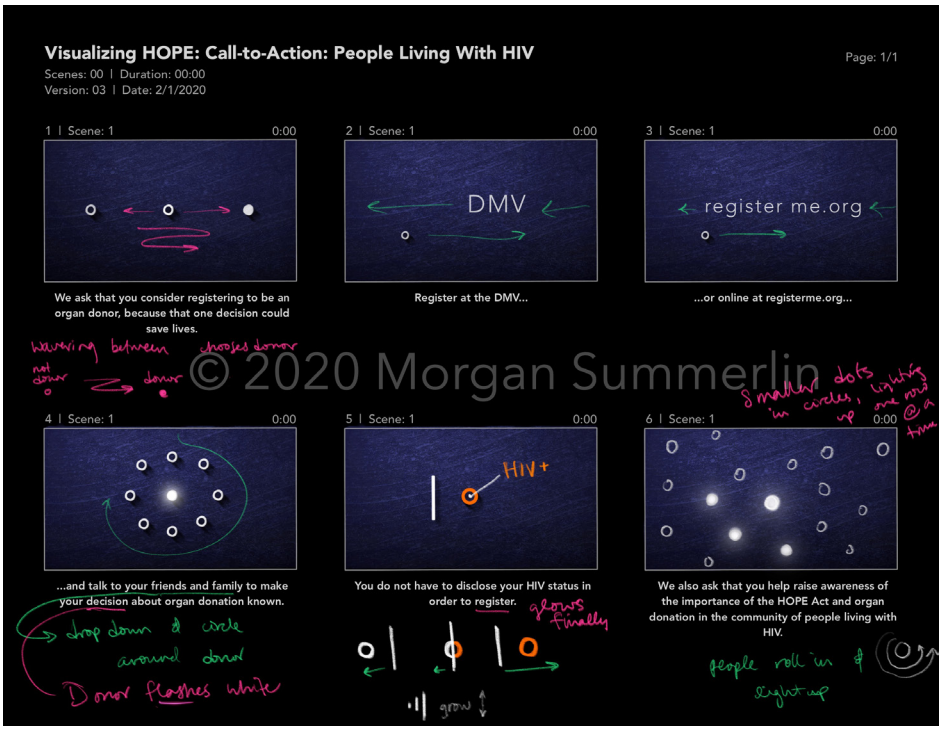

Figure 20. Storyboard for Animation 1. Storyboard frames for the Call-to-Action clip for the people living with HIV animation (*text not intended to be read*).

Call-to-Action Storyboard for Animation 2:

Nurses at hospitals with trauma centers and OPO representatives

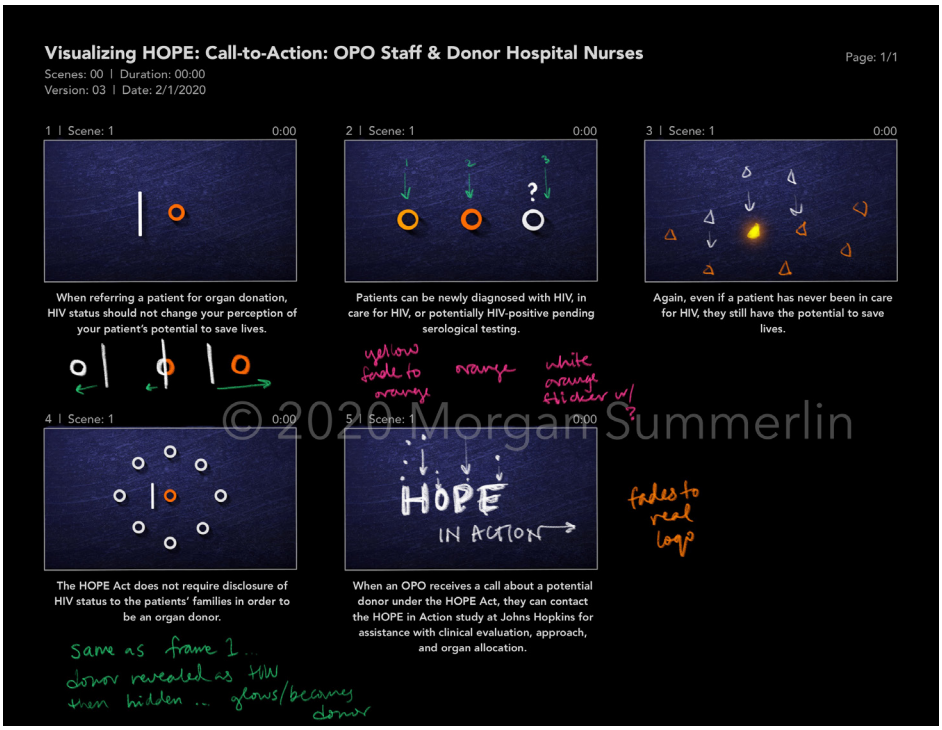

Figure 21. Storyboards for Animation 2. Storyboard frames for the Call-to-Action clip for the donor hospital nurses and OPO representatives animation (*text not intended to be read*).

Appendix B: Selected Animation Stills

Reusable Clips for Animations 1 and 2

Figure 22.1. Still for Animations 1 and 2. Opening screen.

Figure 22.2. Still for Animations 1 and 2. Audio: Nearly 114,000 people in the United States are currently in need of an organ transplant.

Figure 22.3. Still for Animations 1 and 2. Audio: Every day, over 100 people are added to the waitlist…

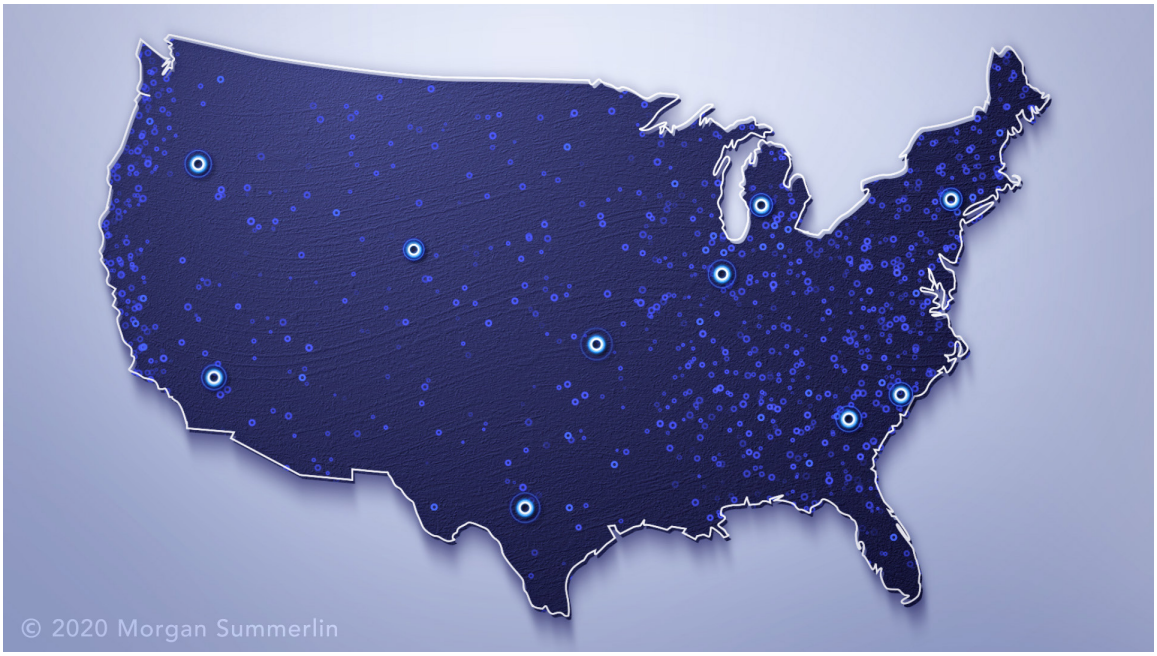

Figure 22.4. Still for Animations 1 and 2. Audio: …and 20 will die having never received the lifesaving transplant they needed.

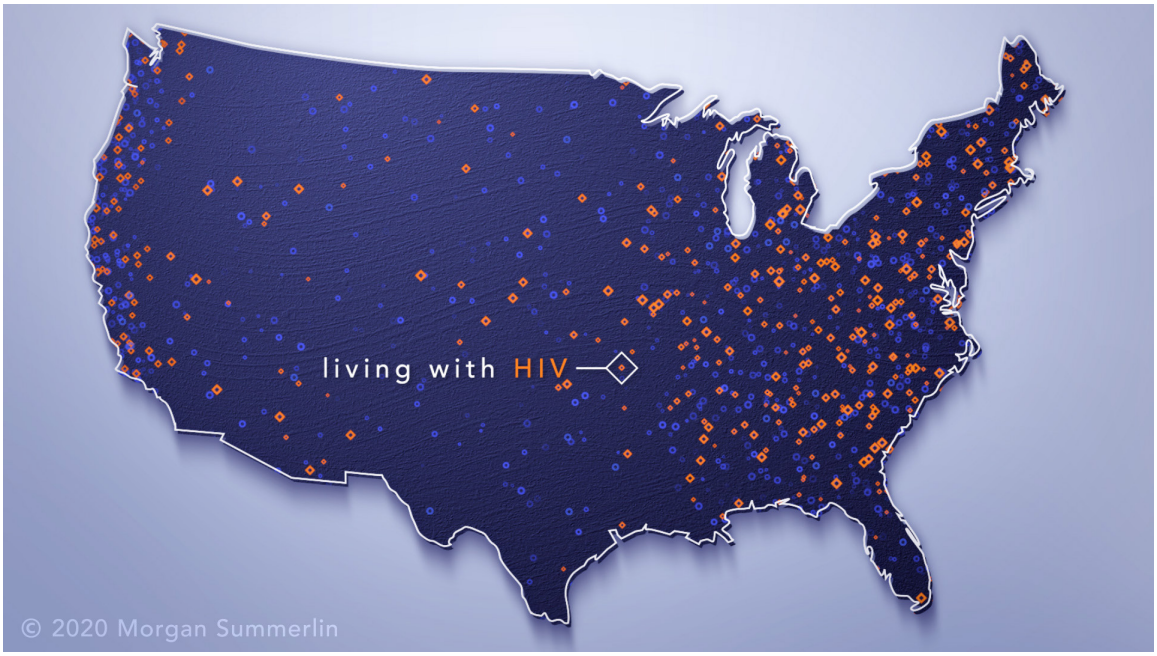

Figure 22.5. Still for Animations 1 and 2. Audio: A growing number of those waiting are also living with HIV…

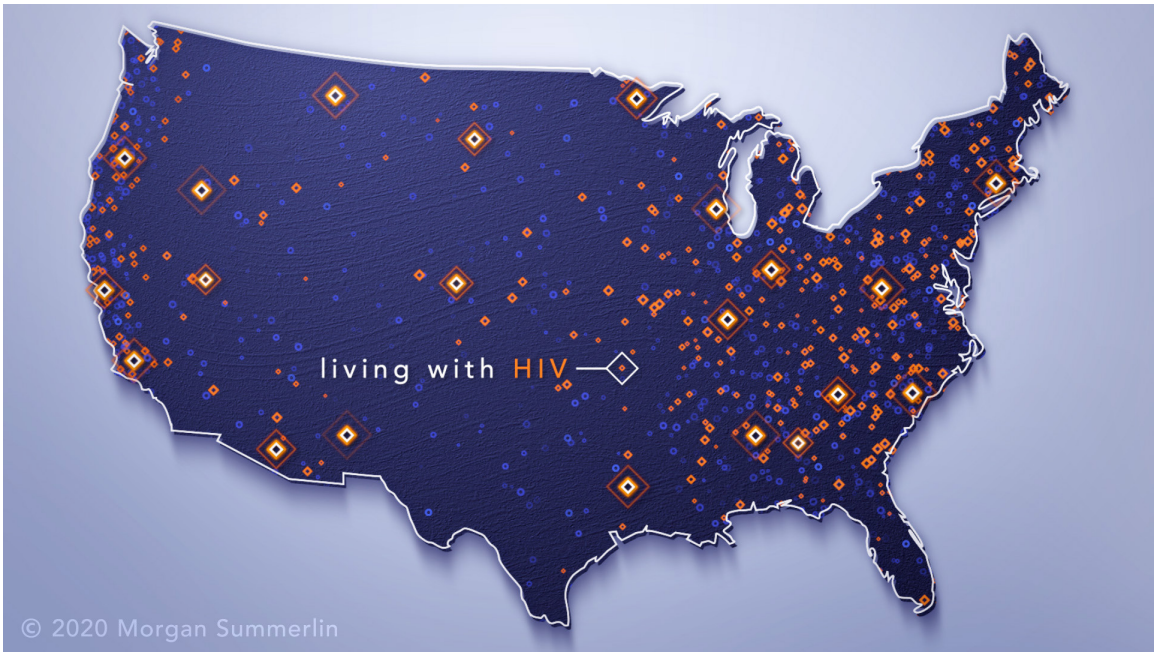

Figure 22.6. Still for Animations 1 and 2. Audio: …and are more likely to die waiting for a transplant.

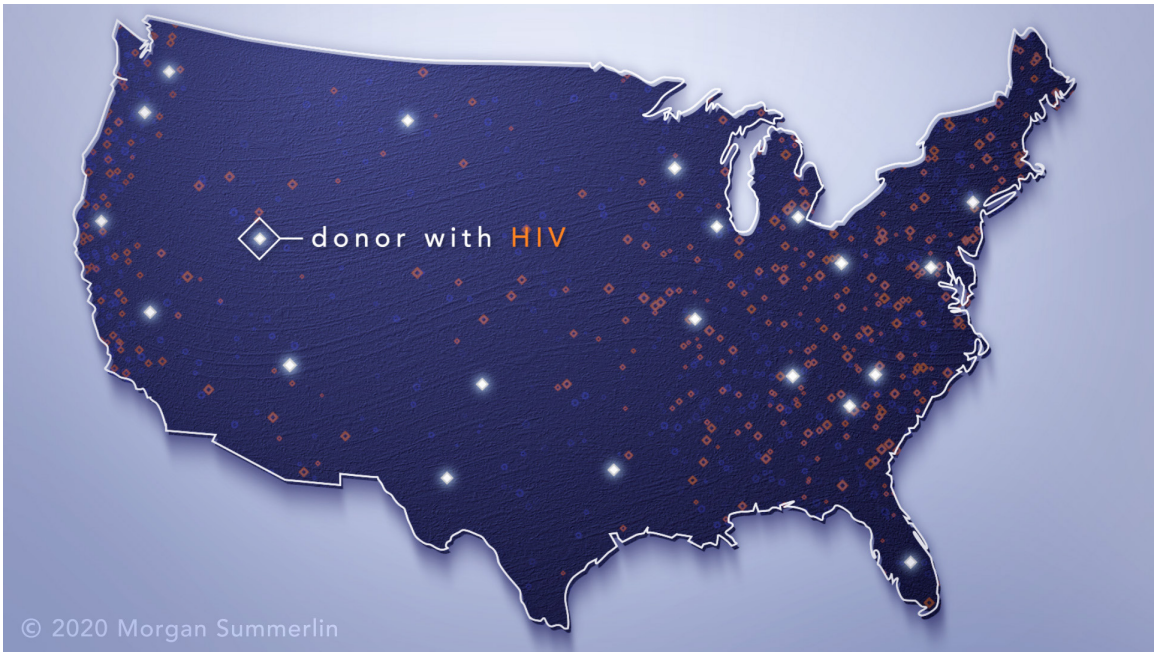

Figure 22.7. Still for Animations 1 and 2. Audio: In the past, organs from donors with HIV…

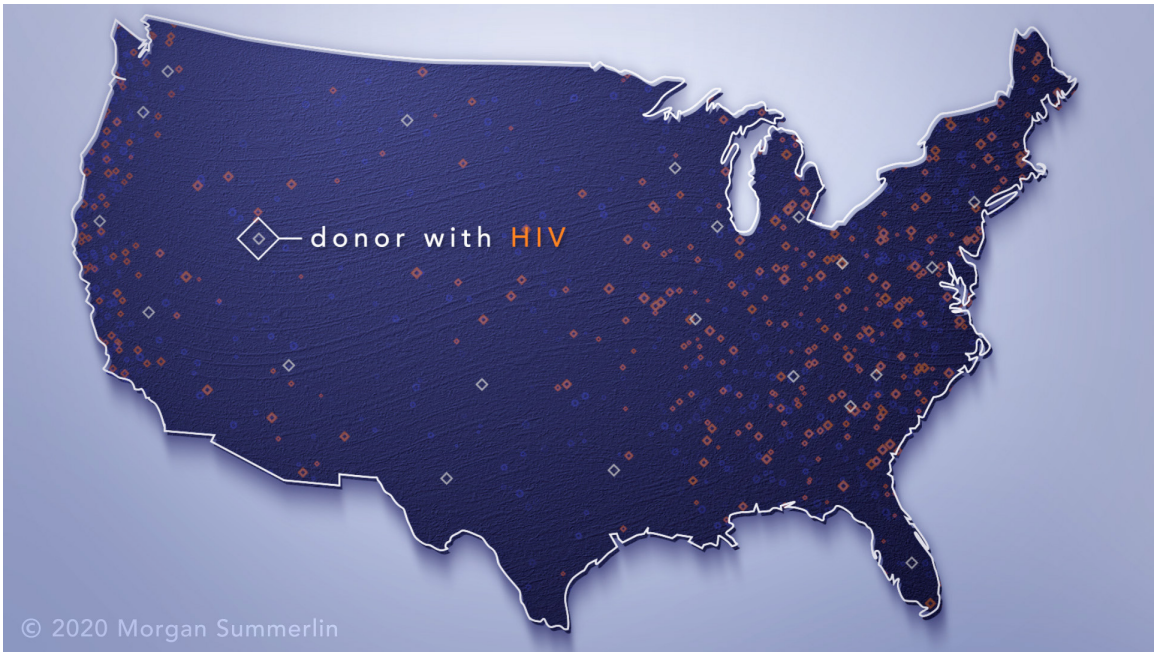

Figure 22.8. Still for Animations 1 and 2. Audio: …were considered unsafe, and were banned from use in transplantation.

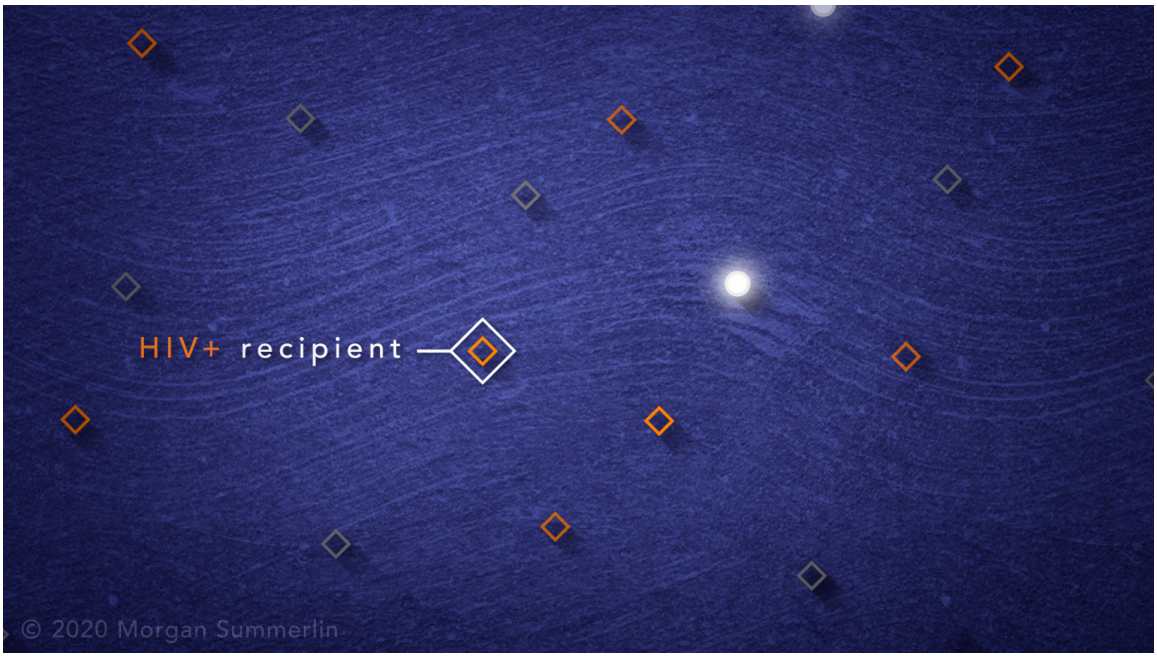

Figure 22.9. Still for Animations 1 and 2. Audio: Historically, people with HIV…

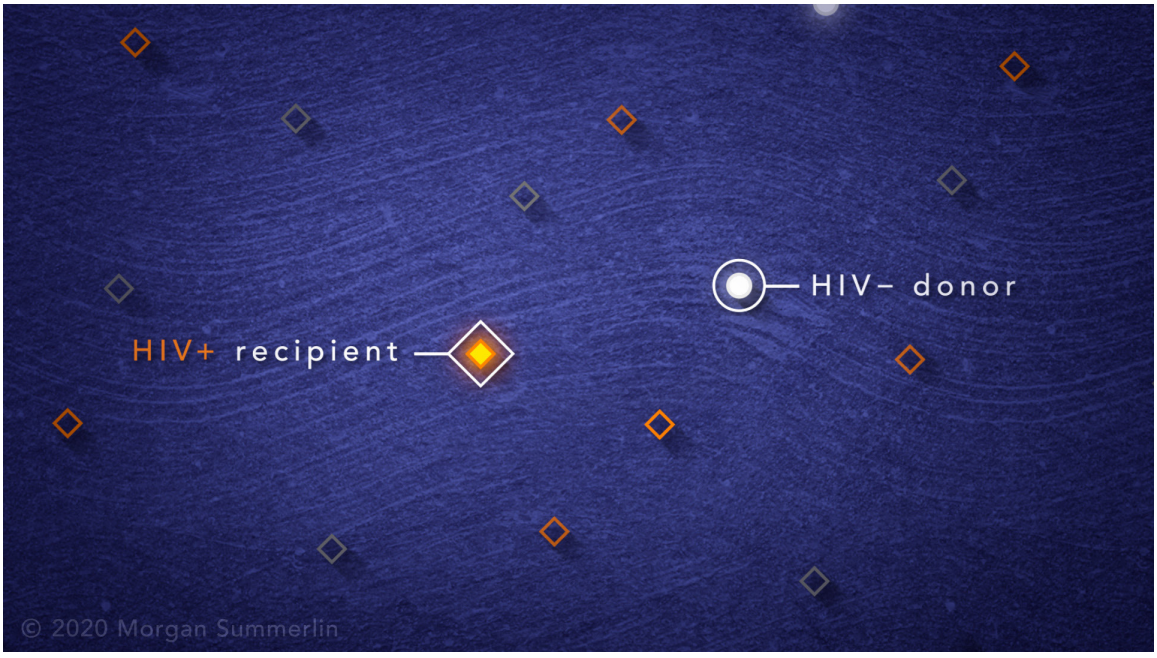

Figure 22.10. Still for Animations 1 and 2. Audio: …received organ donations from people without HIV

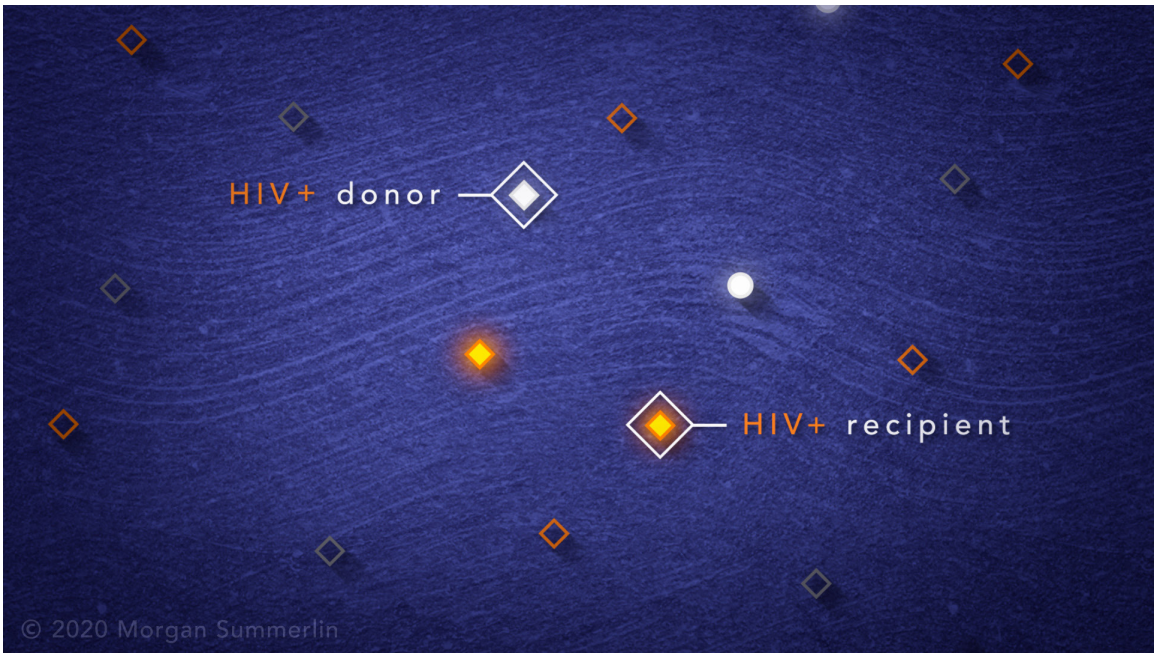

Figure 22.11. Still for Animations 1 and 2. Audio: However, studies show that they can also receive organs from people with HIV, with equally successful outcomes.

Figure 22.12. Still for Animations 1 and 2. Audio: The HIV Organ Policy Equity Act…

Figure 22.13. Still for Animations 1 and 2. Audio: …or HOPE Act…

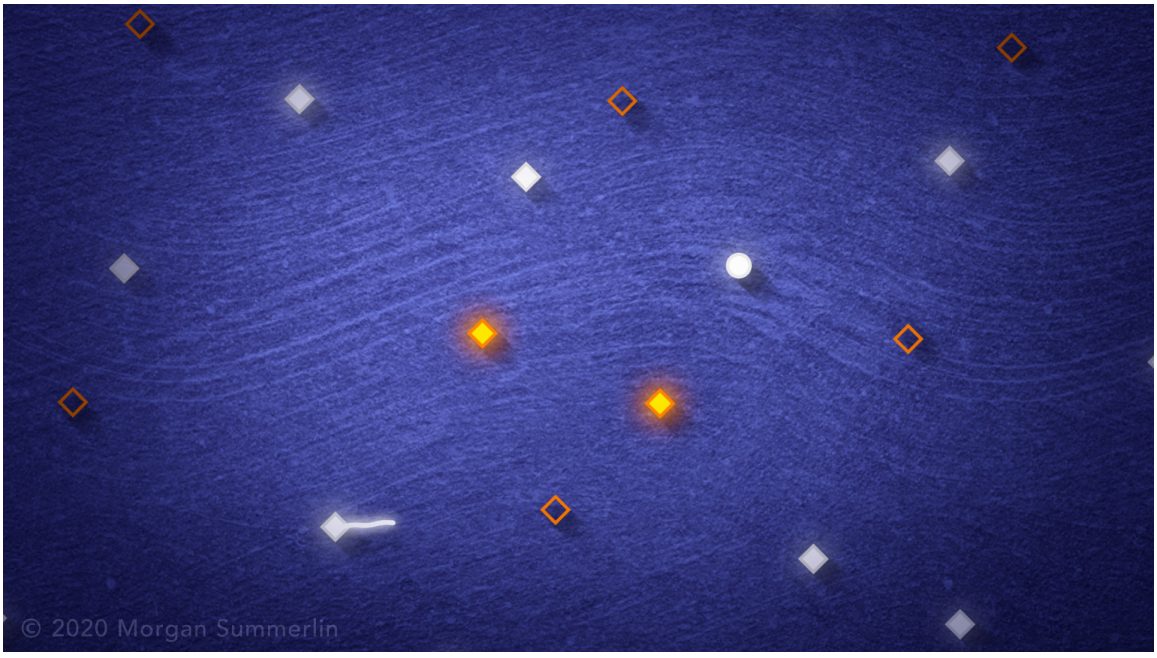

Figure 22.14. Still for Animations 1 and 2. Audio: …was passed in two thousand thirteen, and legalized transplanting organs from donors with HIV to people who also have HIV.

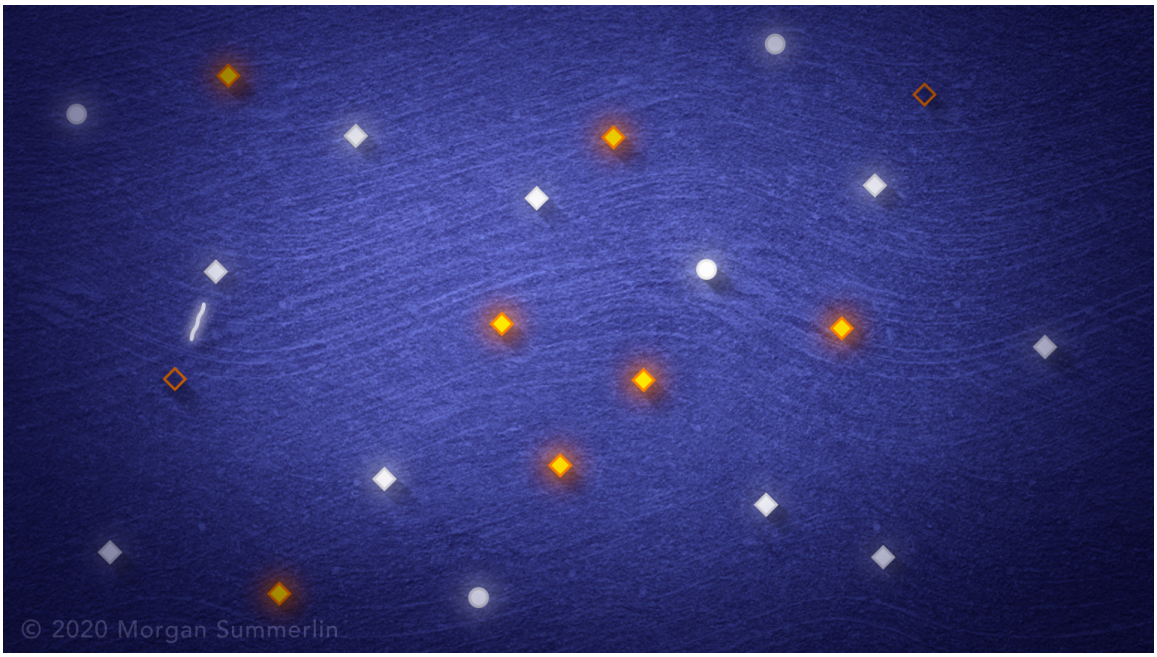

Figure 22.15. Still for Animations 1 and 2. Audio: Thanks to the HOPE Act, people in need of an organ are more likely to receive a transplant:

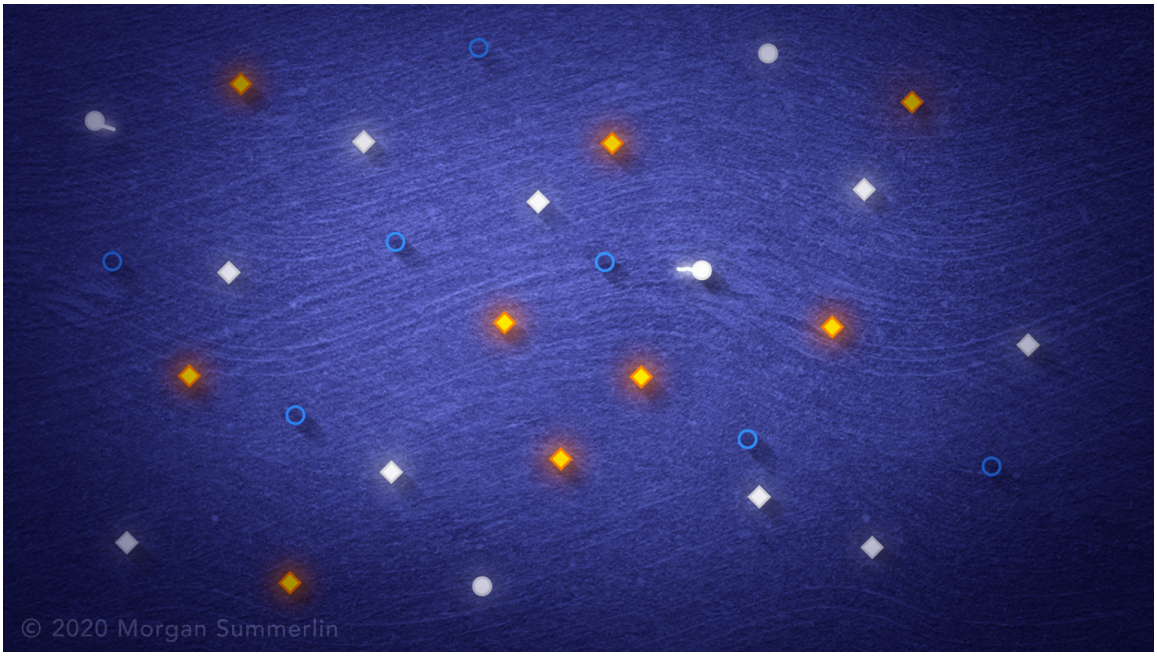

Figure 22.16. Still for Animations 1 and 2. Audio: Transplanting organs between donors and recipients with HIV provides more organs for people without HIV…

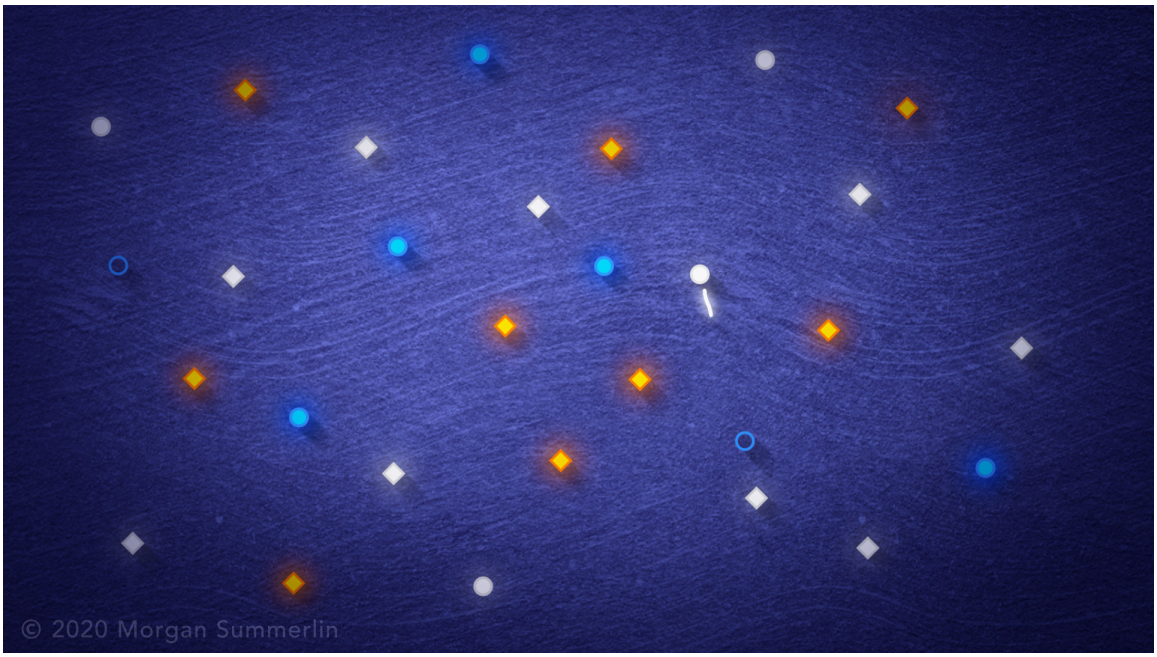

Figure 22.17. Still for Animations 1 and 2. Audio: … and creates more life-saving transplants every year.

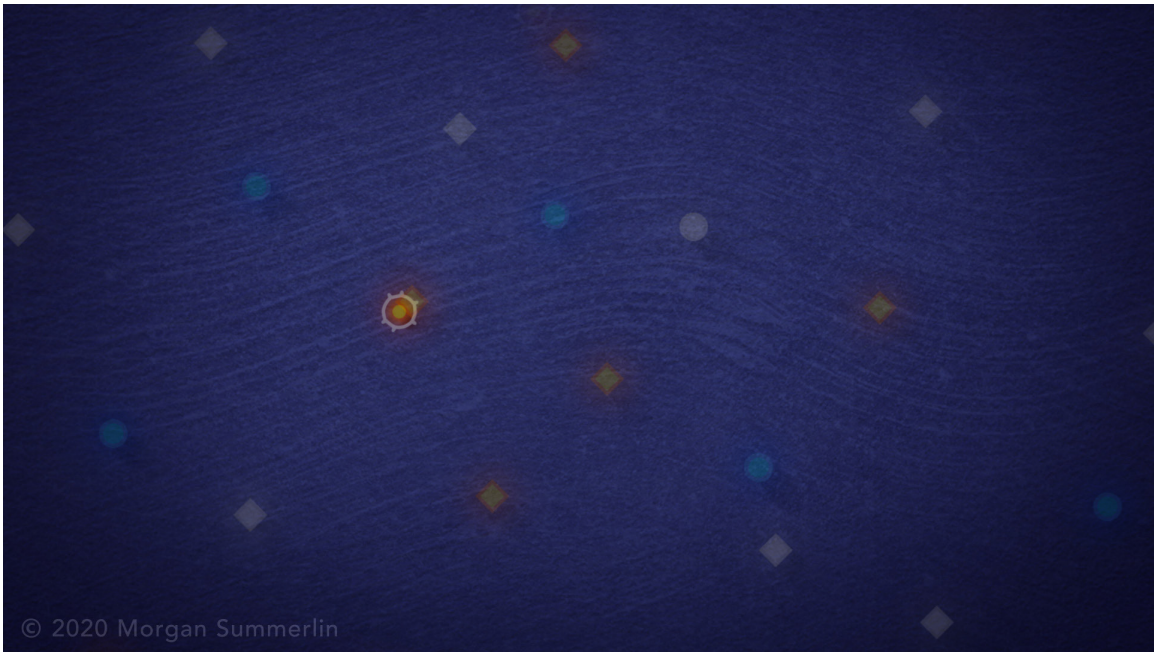

Figure 22.18. Still for Animations 1 and 2. Audio: How is it possible that patients with HIV can receive organs from donors who also have HIV?

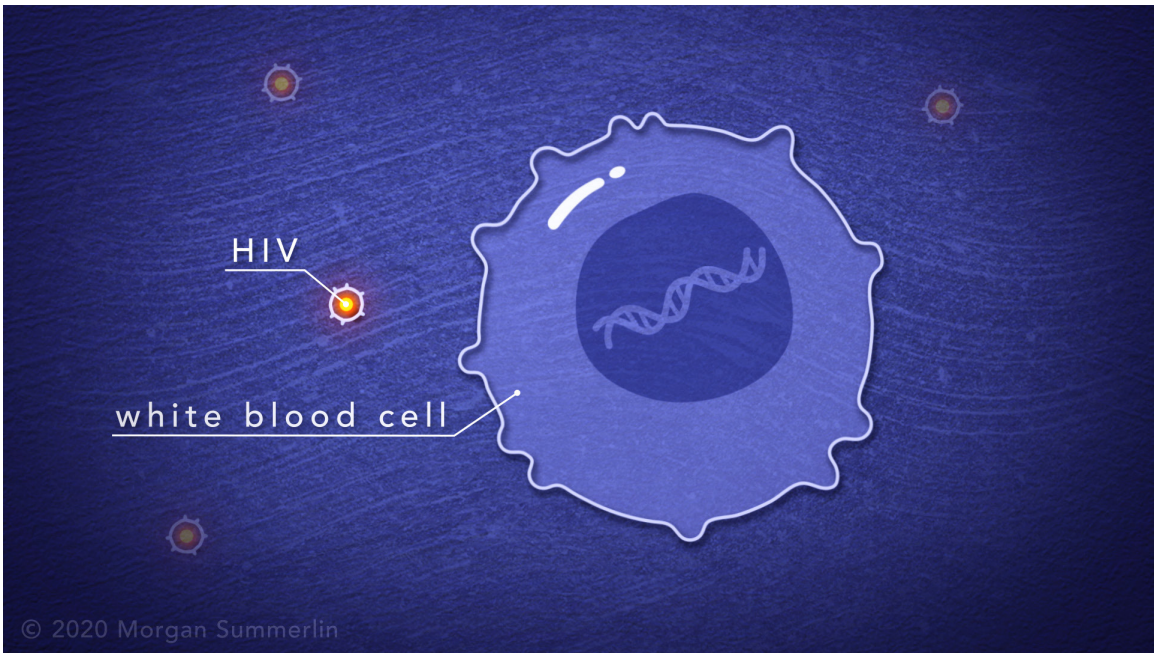

Figure 22.19. Still for Animations 1 and 2. Audio: HIV is a virus that primarily infects the body's white blood cells.

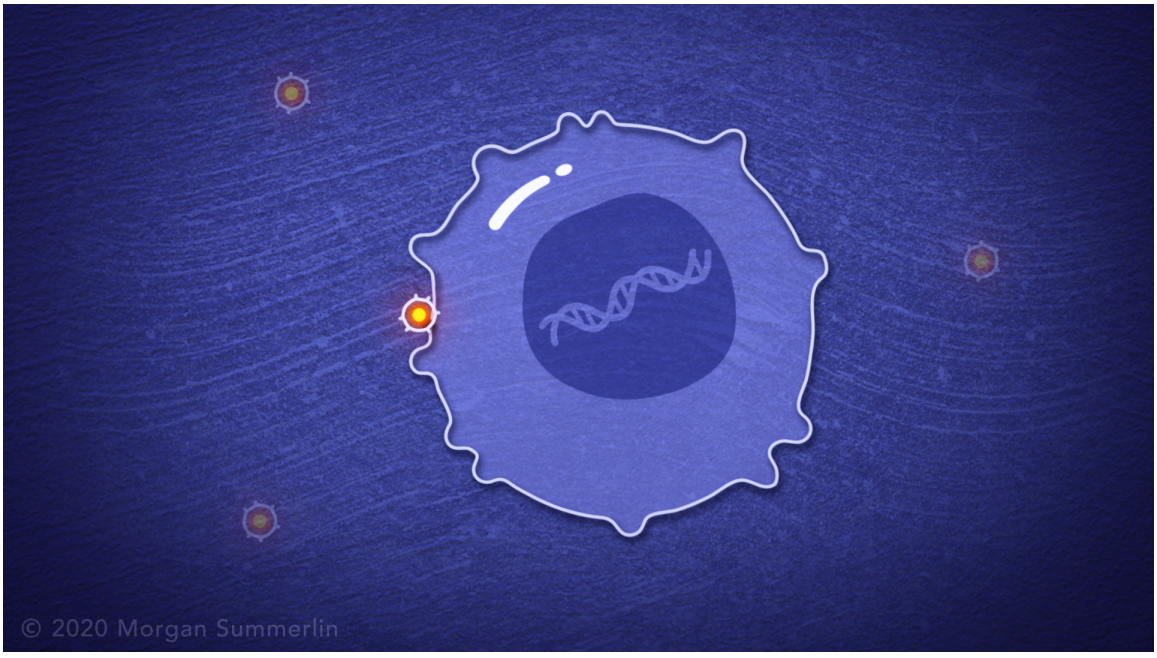

Figure 22.20. Still for Animations 1 and 2. Audio: The virus enters a host cell…

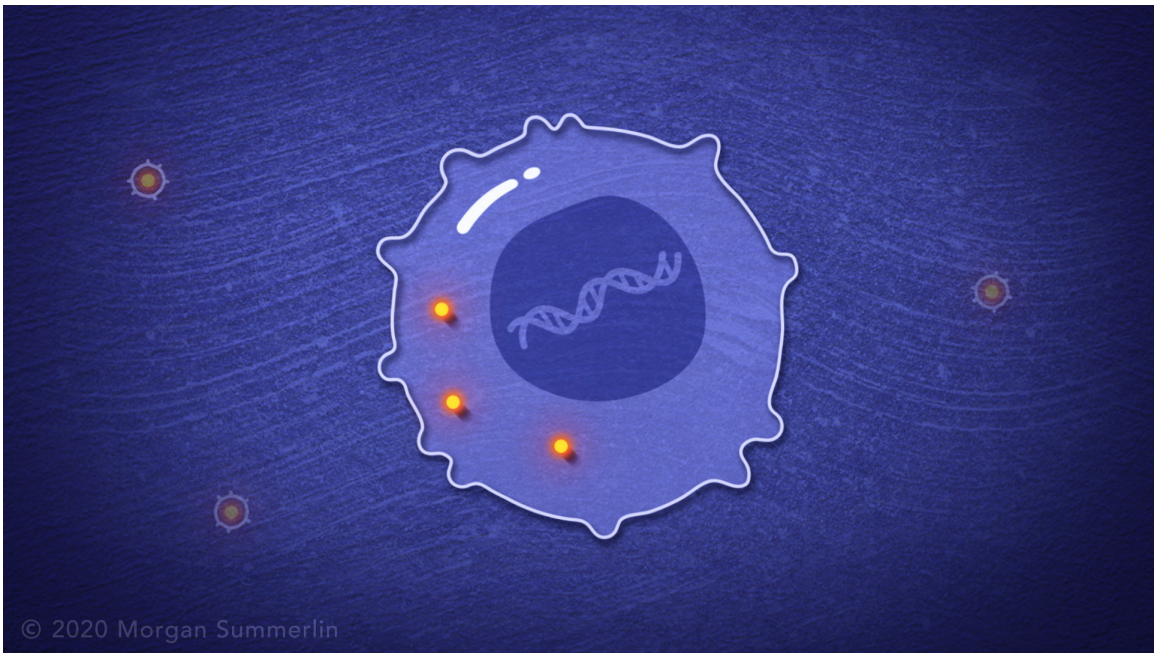

Figure 22.21. Still for Animations 1 and 2. Audio: …where it makes copies of itself using the host cell's machinery.

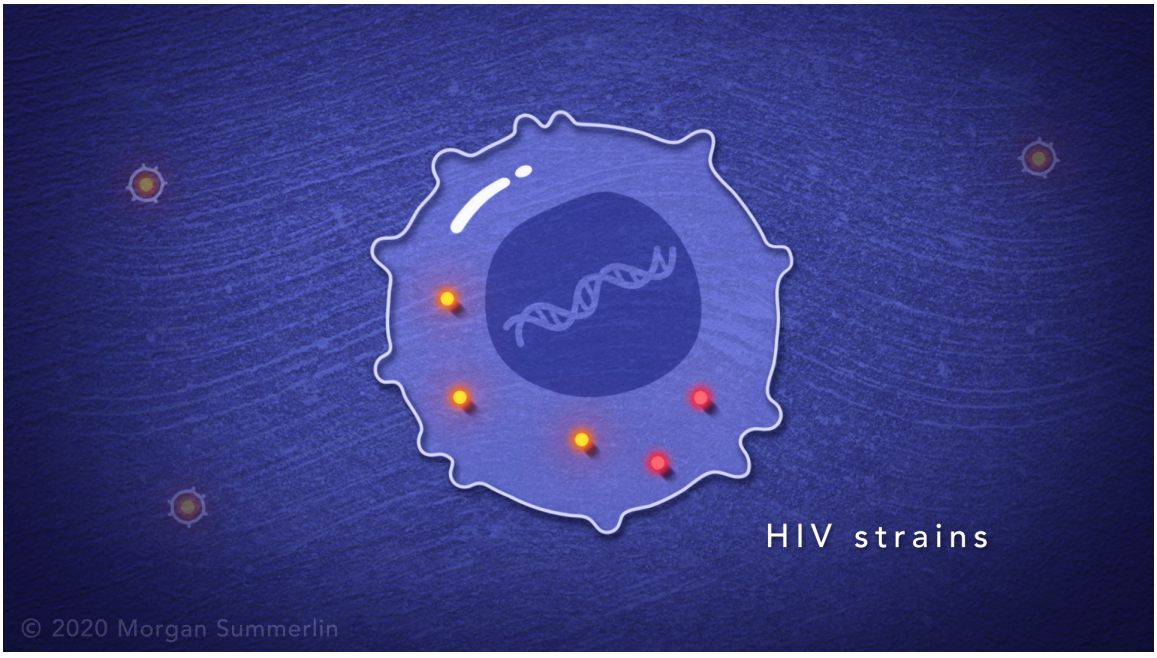

Figure 22.22. Still for Animations 1 and 2. Audio: As it replicates, HIV has the ability to mutate and change over time, which creates unique strains of HIV that can differ from person to person.

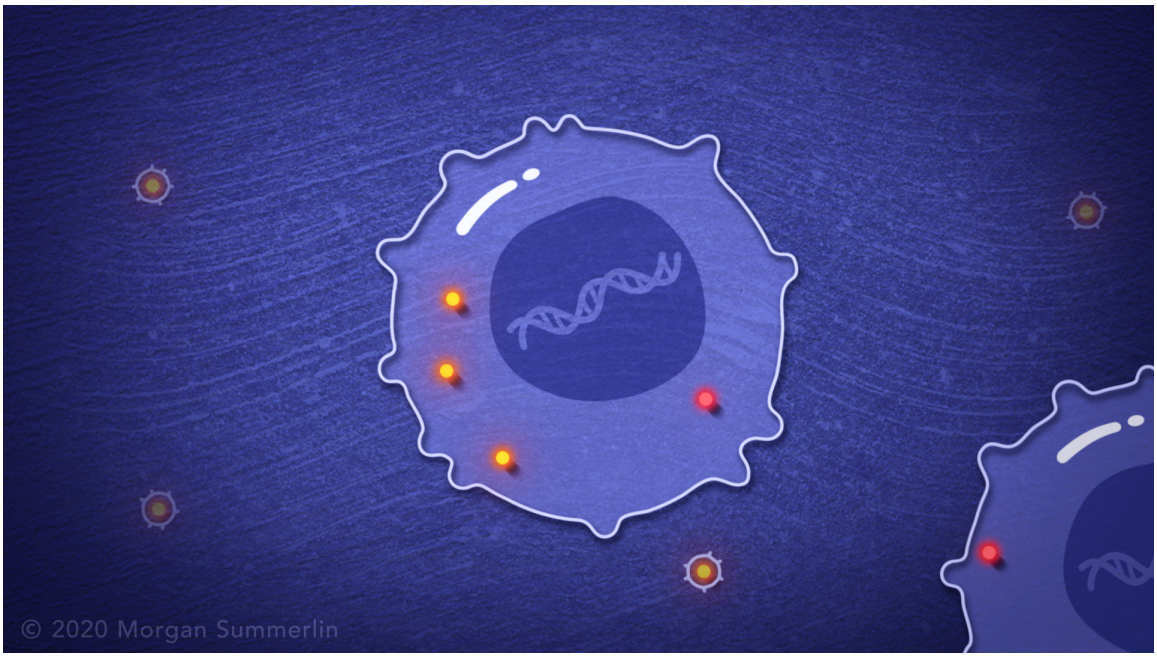

Figure 22.23. Still for Animations 1 and 2. Audio: The virus then leaves the cell to locate a new host and continue its life cycle.

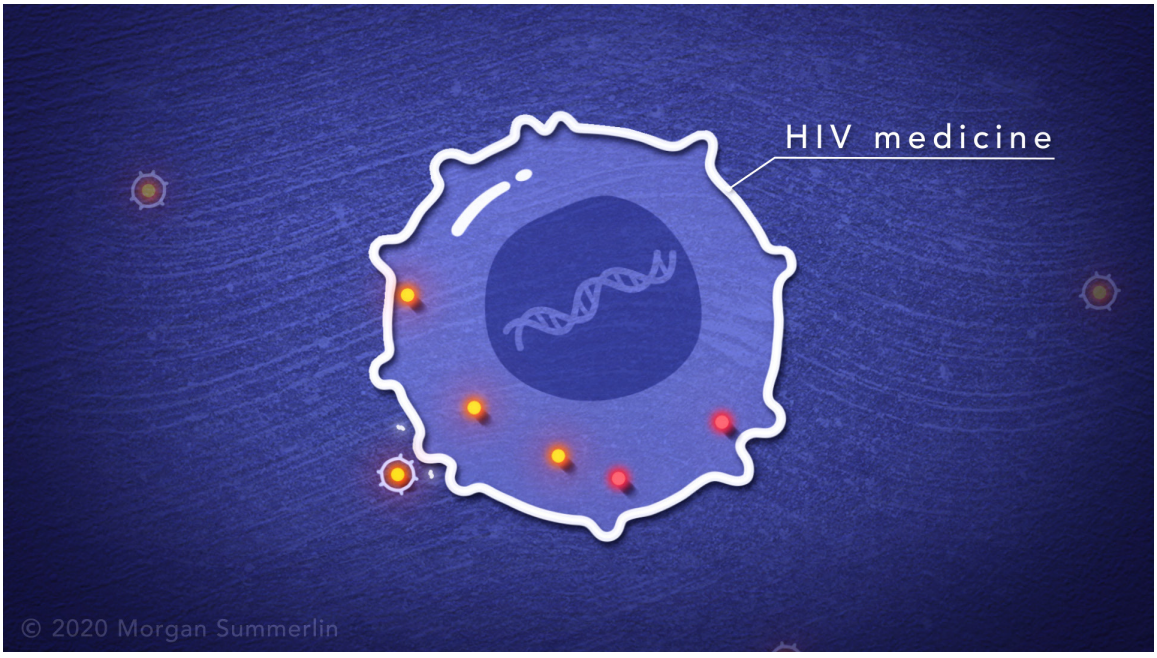

Figure 22.24. Still for Animations 1 and 2. Audio: HIV medicines work by blocking replication and preventing the spread of HIV to other cells, which minimizes levels of HIV in the body.

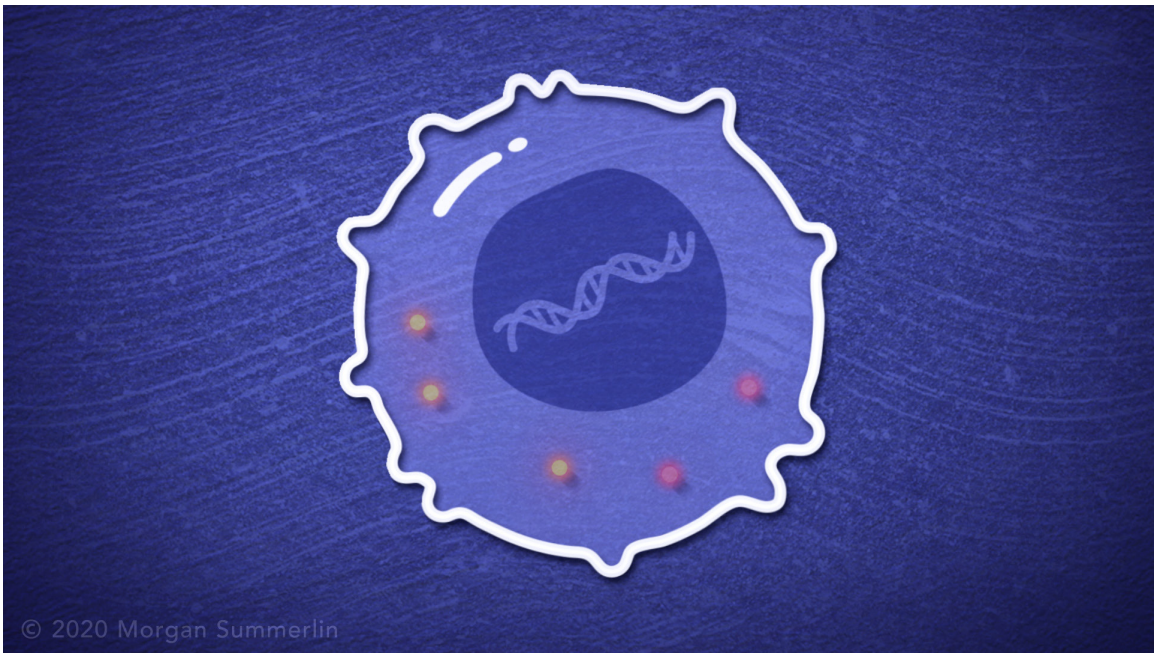

Figure 22.25. Still for Animations 1 and 2. Audio: Decades of research into HIV medicines has allowed HIV to become a controlled condition rather than a deadly disease.

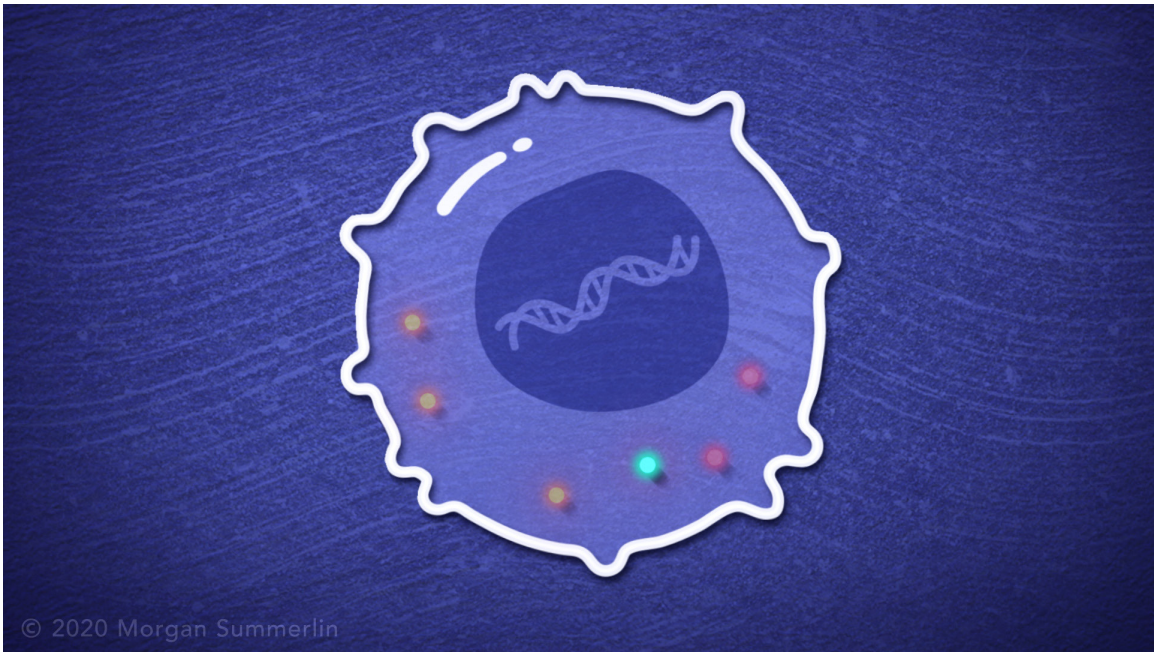

Figure 22.26. Still for Animations 1 and 2. Audio: However, when HIV mutates…

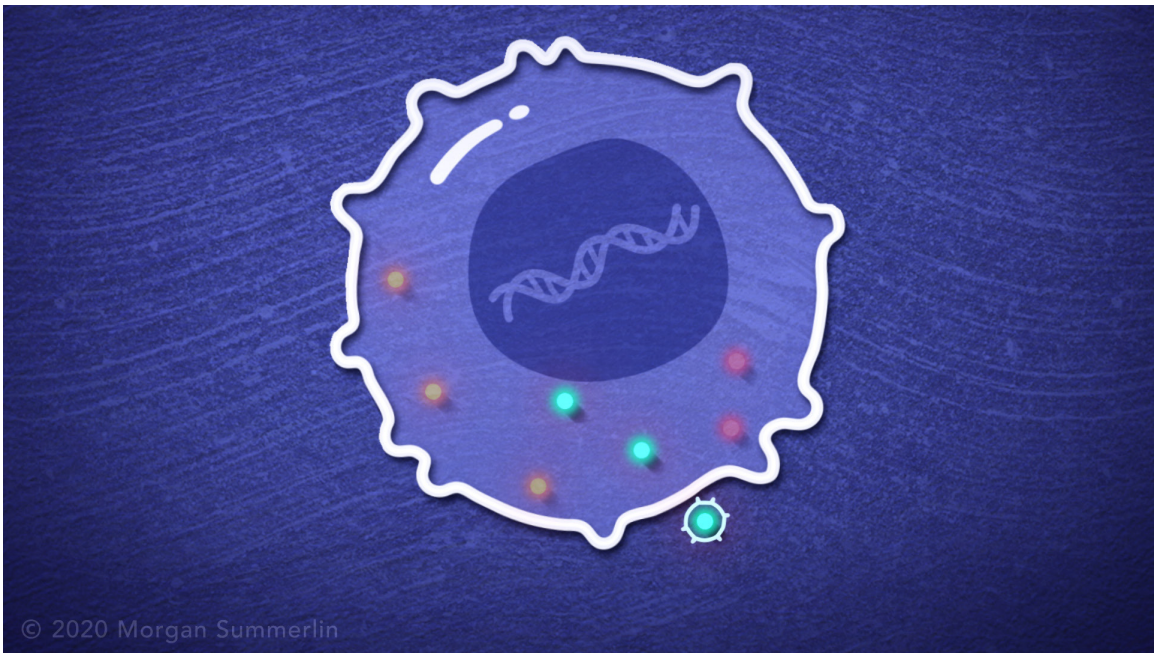

Figure 22.27. Still for Animations 1 and 2. Audio: …it can become resistant to medication.

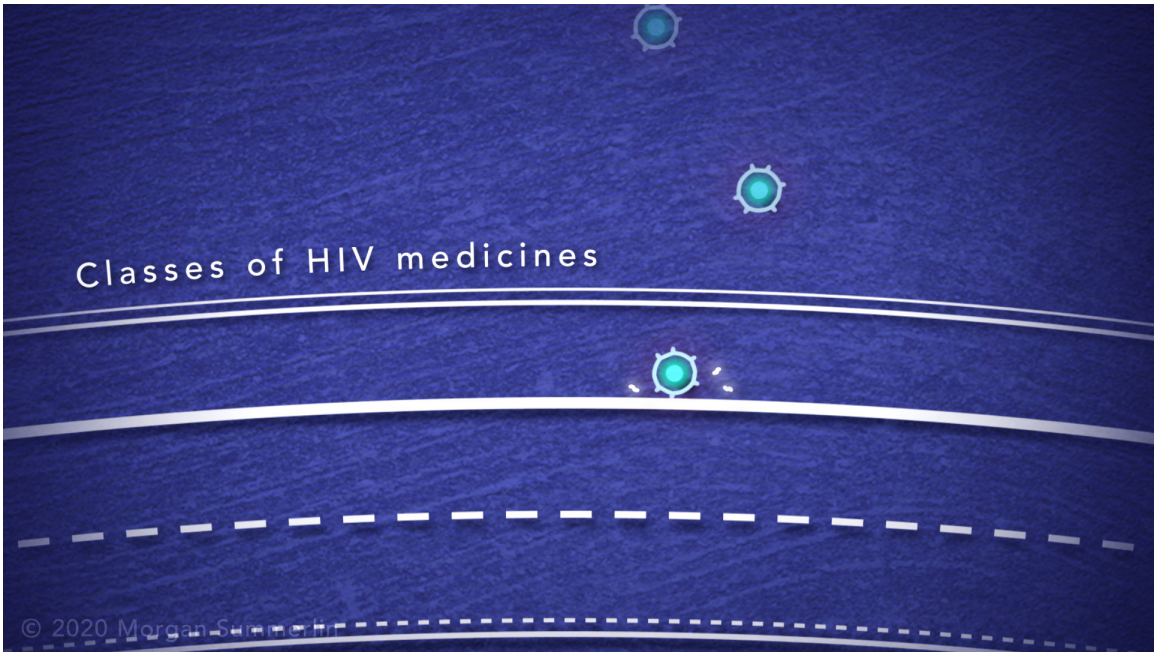

Figure 22.28. Still for Animations 1 and 2. Audio: Fortunately, there are multiple classes of HIV medicines that block HIV replication in different ways.

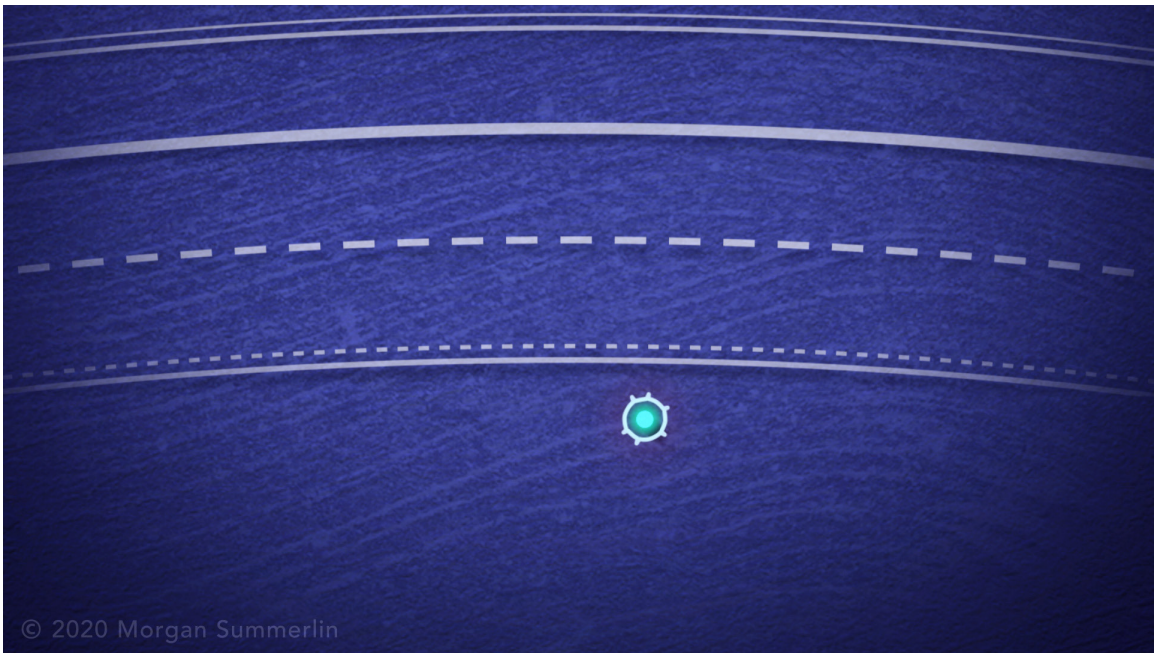

Figure 22.29. Still for Animations 1 and 2. Audio: If HIV becomes resistant to one class of medicines…

Figure 22.30. Still for Animations 1 and 2. Audio: …others can be substituted to control an HIV infection.

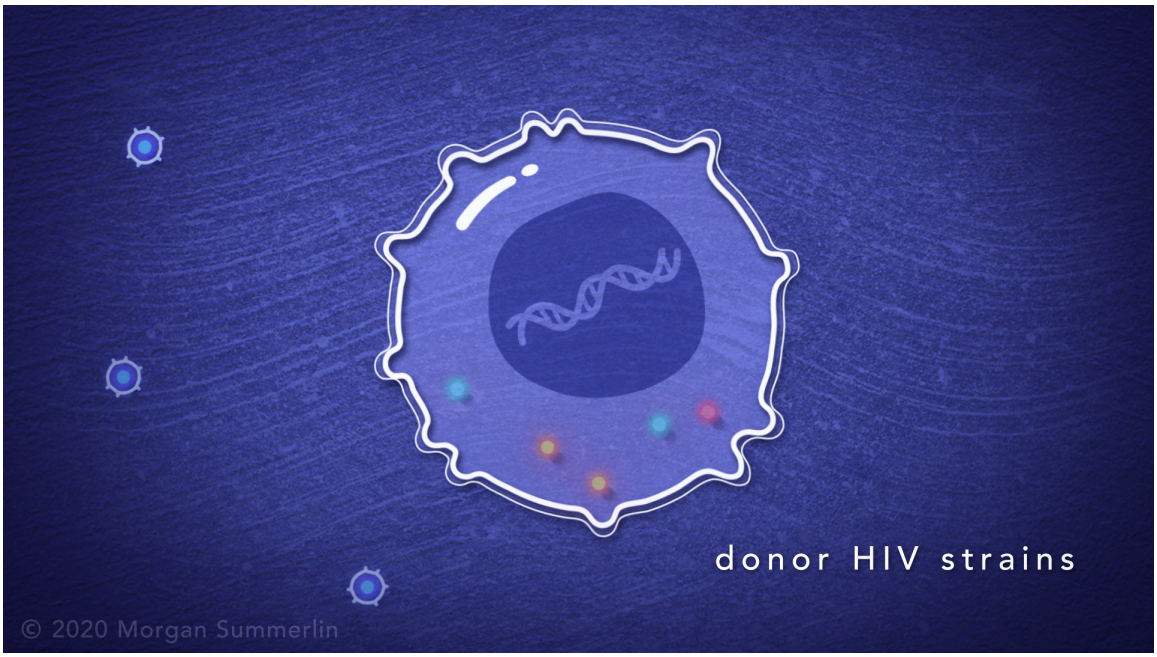

Figure 22.31. Still for Animations 1 and 2. Audio: When someone with HIV is given an organ from a donor with HIV, new strains of the virus can be introduced with the organ.

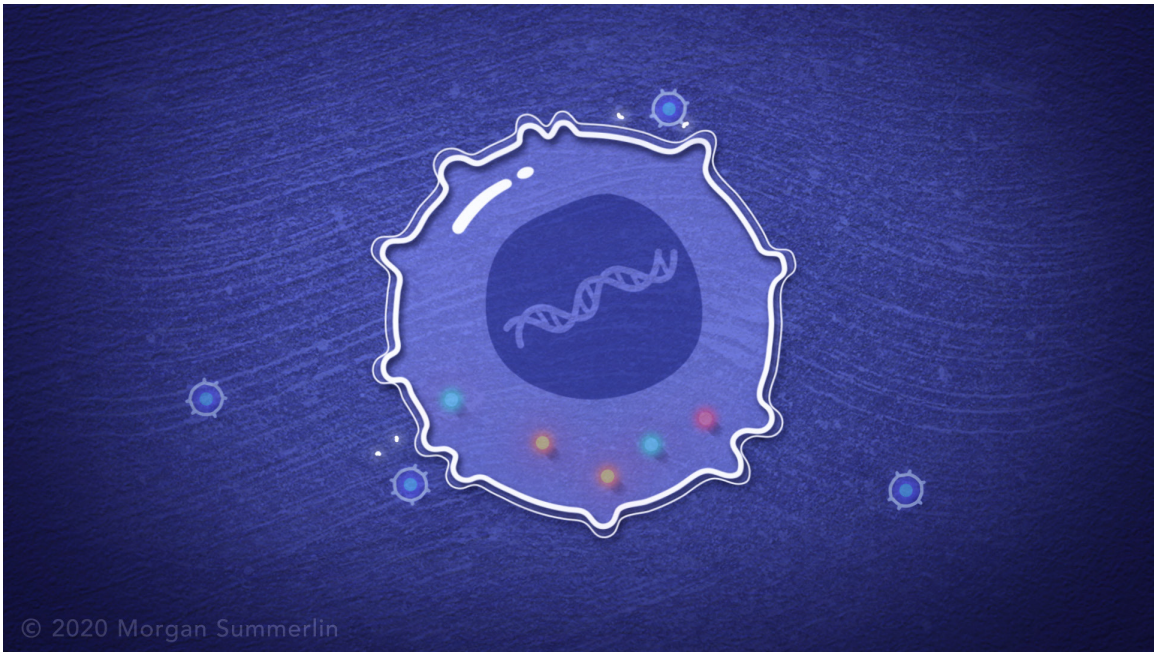

Figure 22.32. Still for Animations 1 and 2. Audio: Fortunately, the recipient's current HIV medicines are likely to control the new strains from the donor.

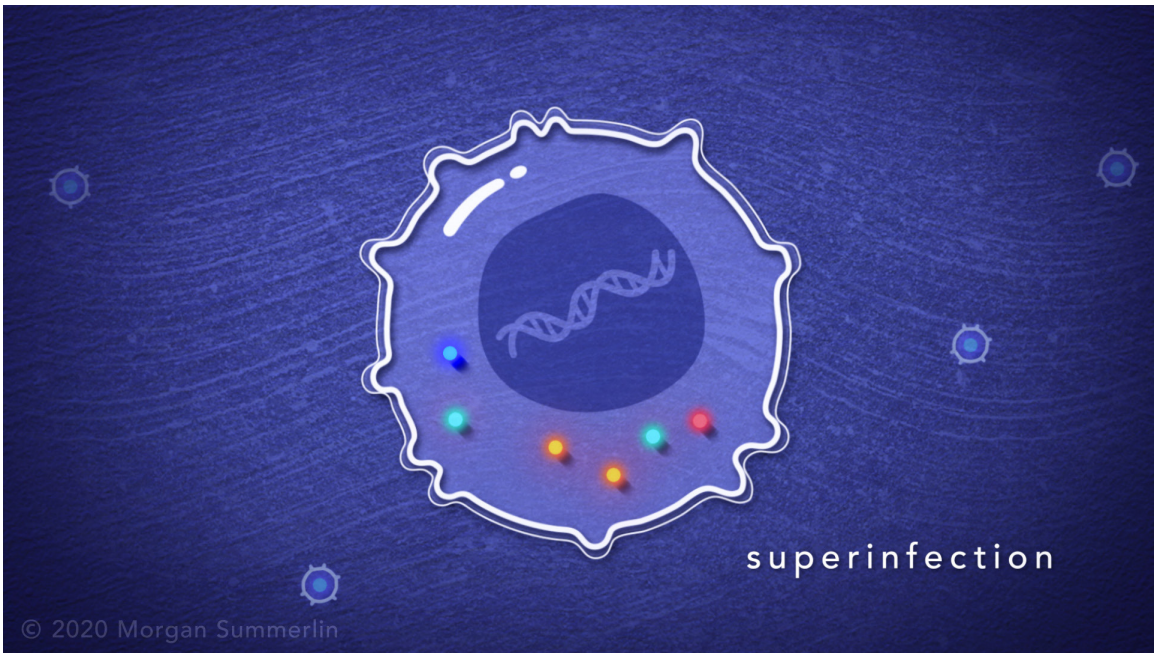

Figure 22.33. Still for Animations 1 and 2. Audio: However, the recipient could become infected with the new strains, in addition to their existing HIV infection. This is called superinfection.

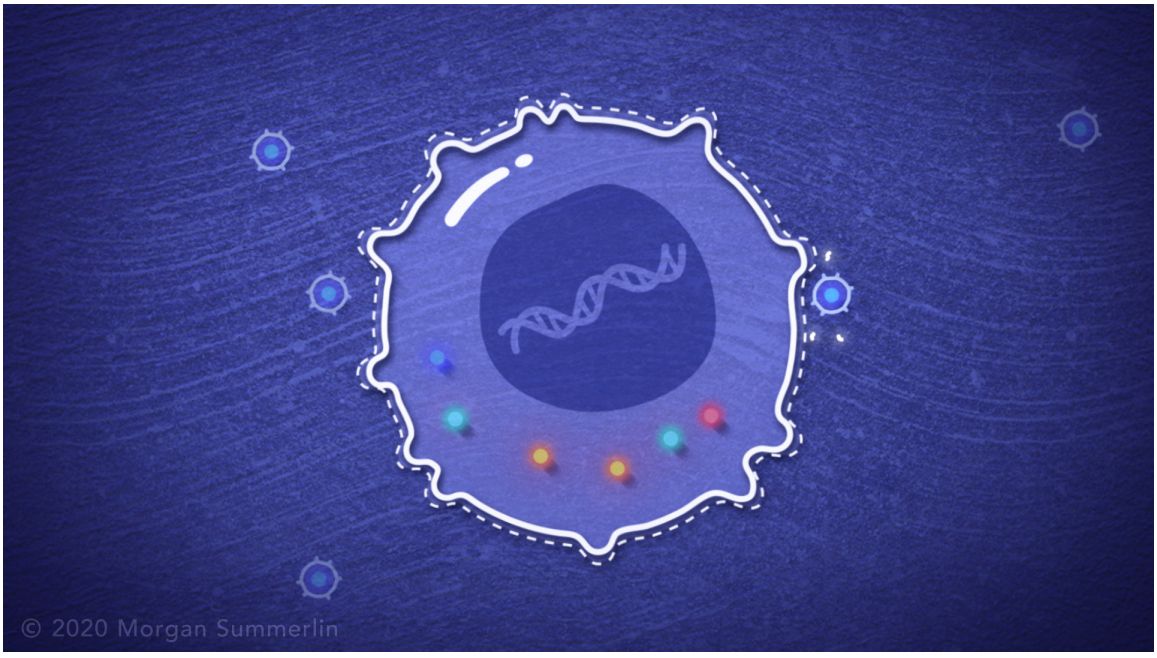

Figure 22.34. Still for Animations 1 and 2. Audio: If superinfection occurs, different HIV medicines will be tried until an effective new combination is found.

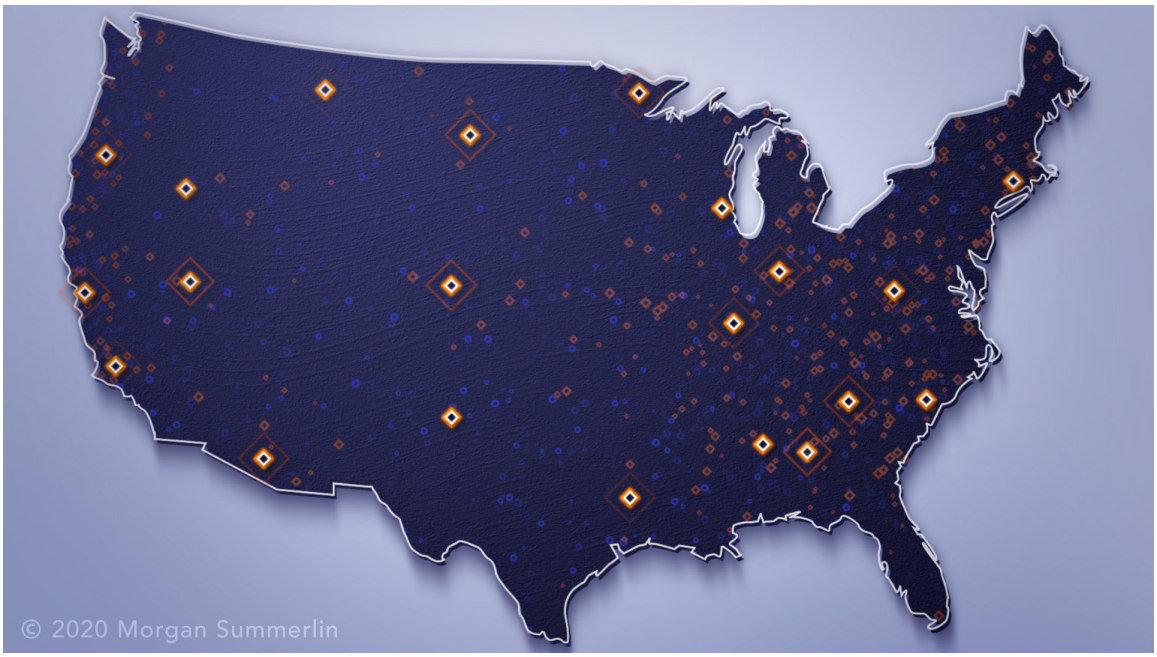

Figure 22.35. Still for Animations 1 and 2. Audio: Fortunately, studies show that the risk of superinfection is low, compared to the greater risk of dying while waiting for an organ.

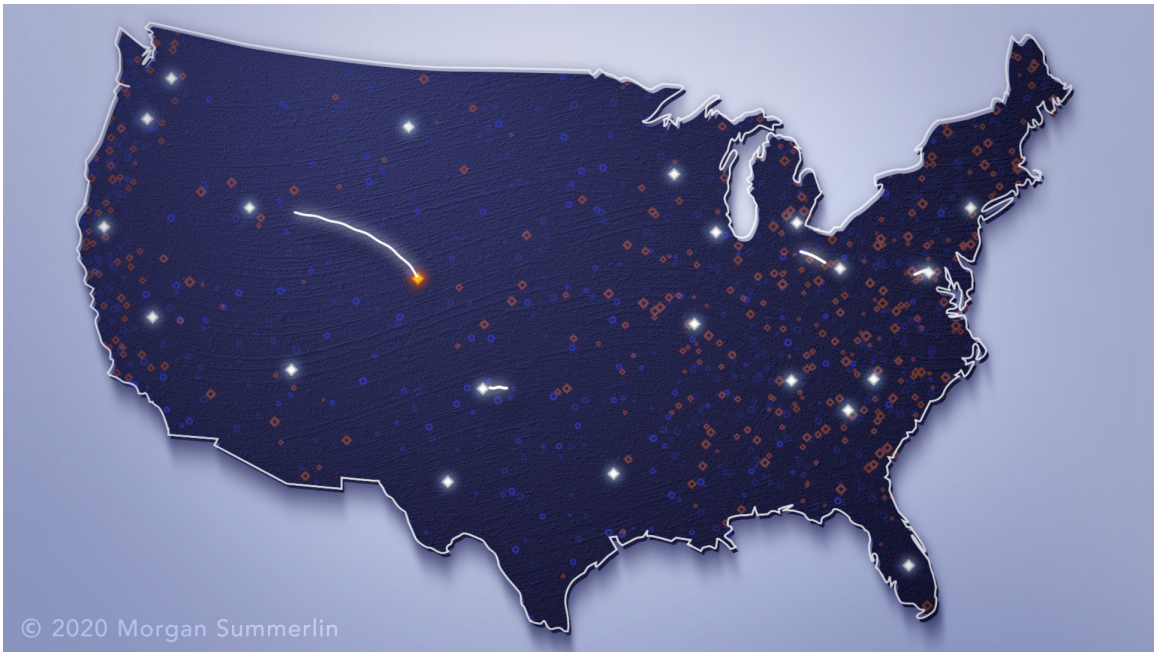

Figure 22.36. Still for Animations 1 and 2. Audio: Organ transplantation between donors and recipients with HIV…

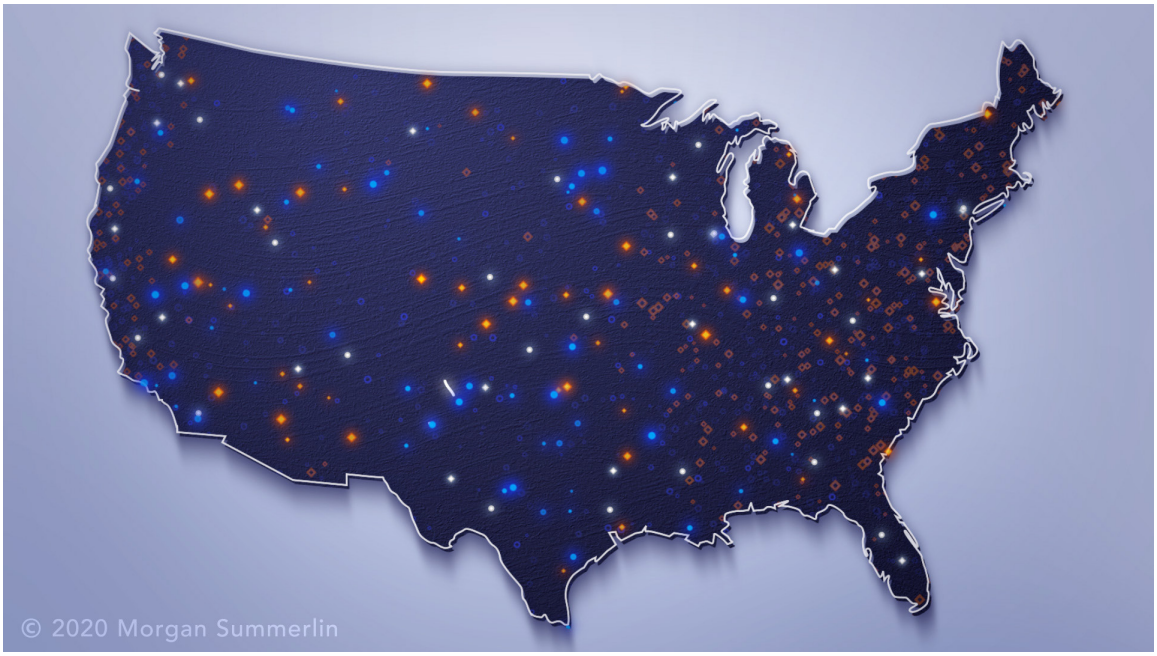

Figure 22.37. Still for Animations 1 and 2. Audio: …is an important step towards shortening the waitlist for organ transplants.

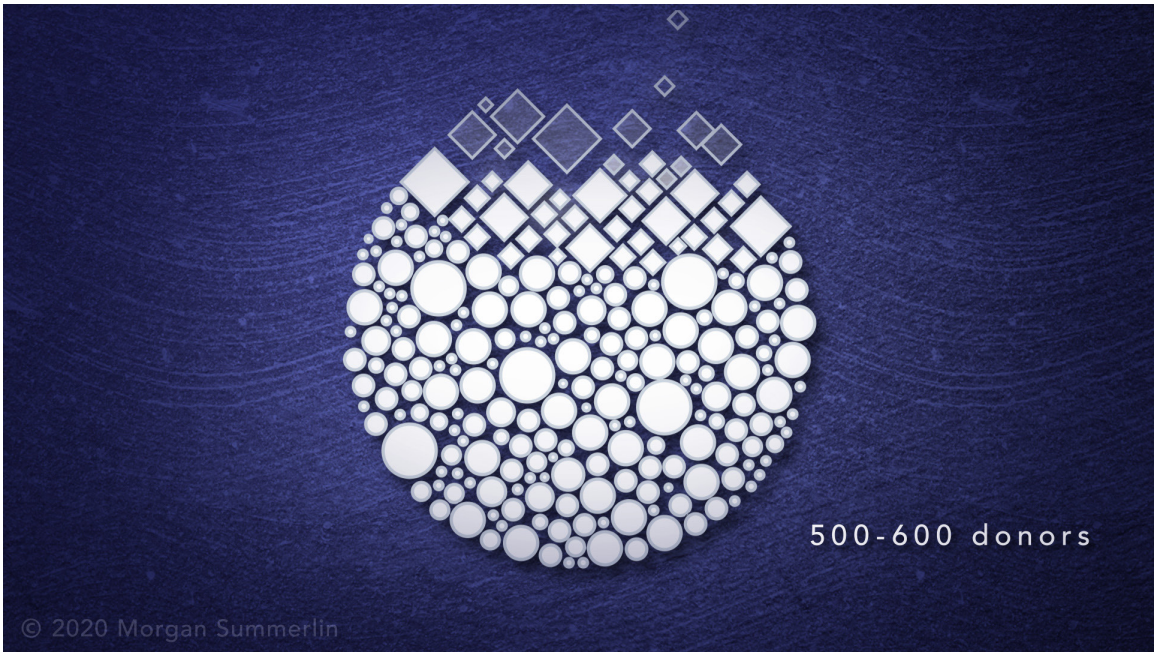

Figure 22.38. Still for Animations 1 and 2. Audio: Under the HOPE Act, 500-600 new donors are expected to be available in the US annually…

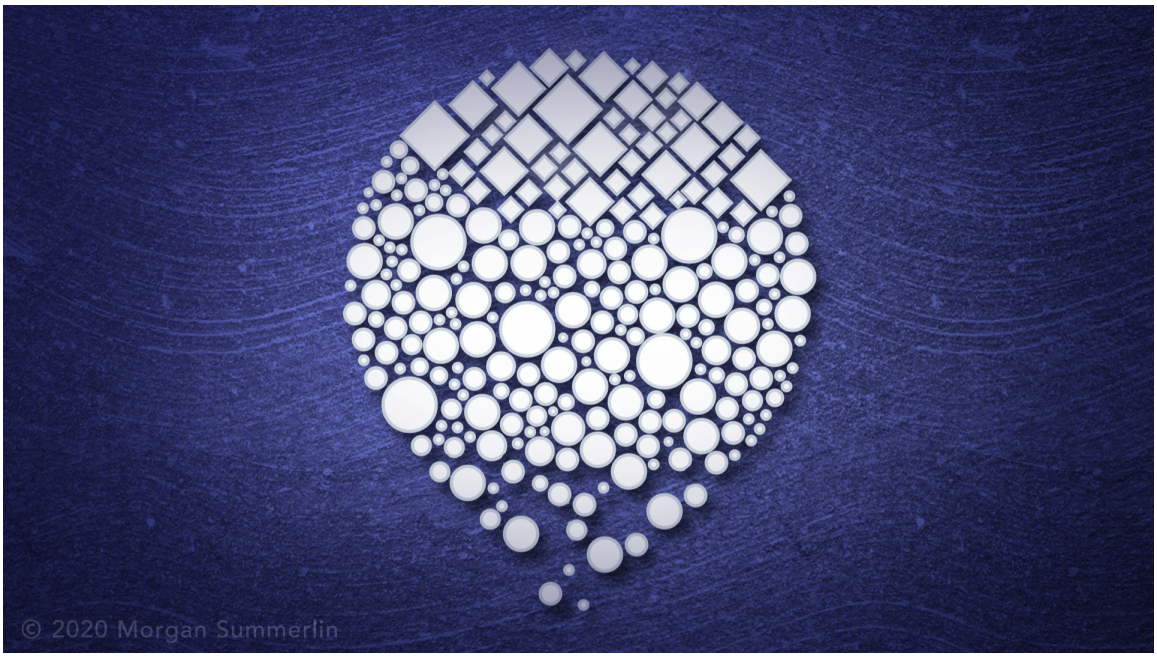

Figure 22.39. Still for Animations 1 and 2. Transition.

Figure 22.40. Still for Animations 1 and 2. Audio: …and up to 10,000 people with HIV could benefit from this change.

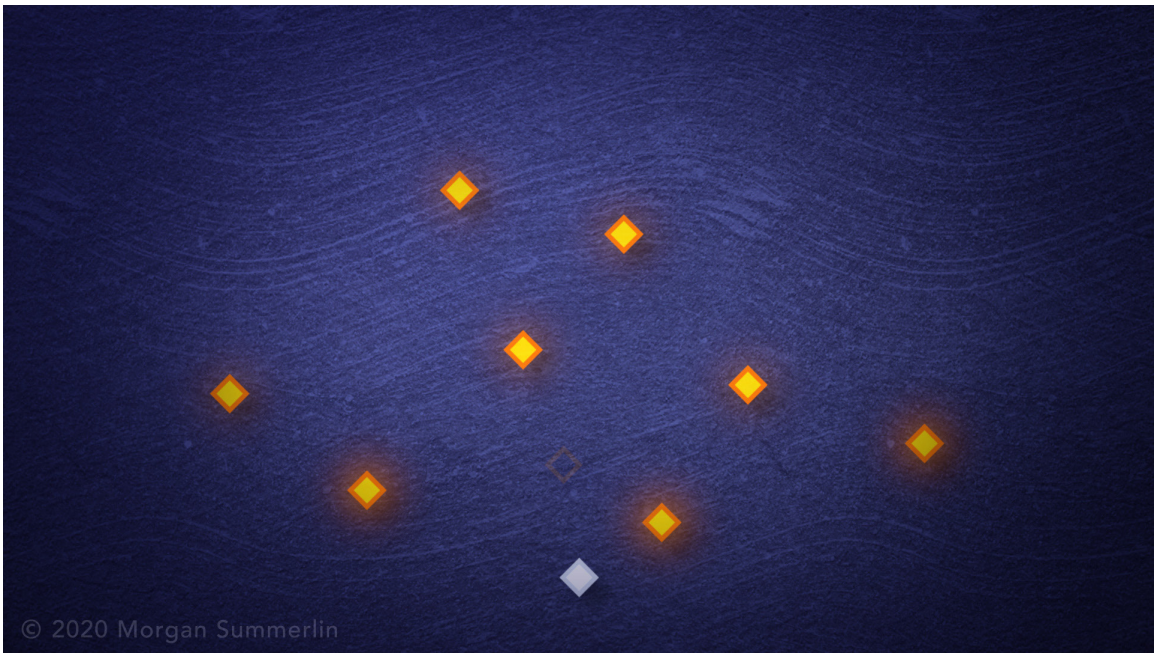

Figure 22.41. Still for Animations 1 and 2. Audio: Your support and participation…

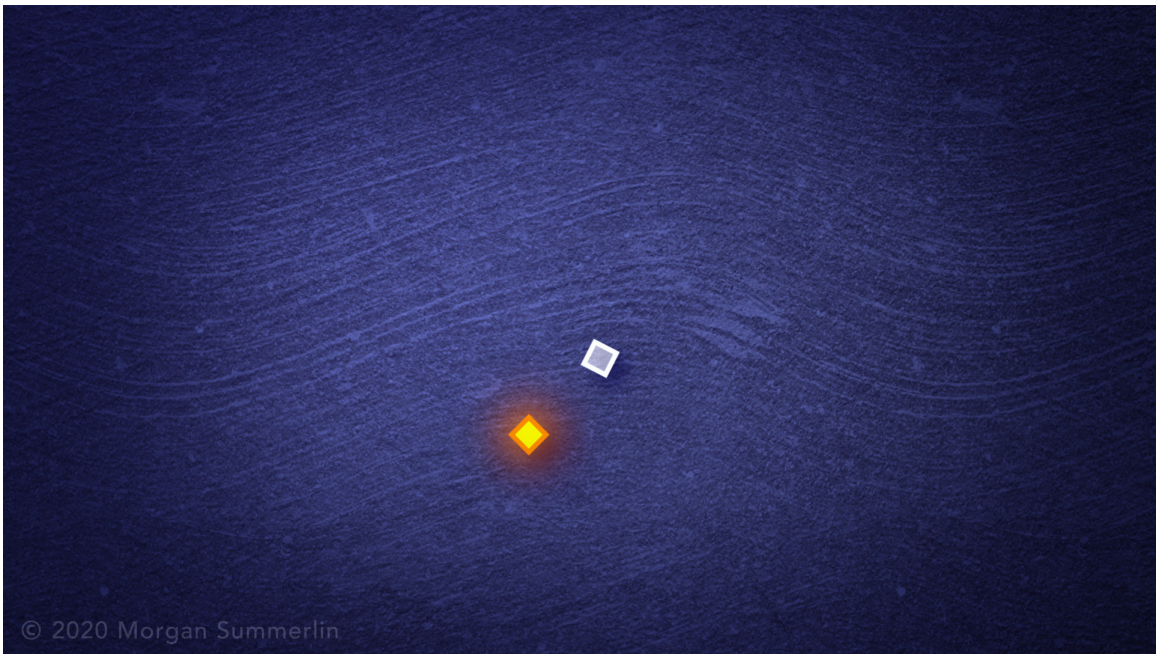

Figure 22.42. Still for Animations 1 and 2. Audio: …can help maximize these life-saving transplants.

Call-to-Action Clip for Animation 1:

People living with HIV

Figure 23.1. Still for Animation 1. Audio: We ask that you consider registering to be an organ donor, because that one decision could save lives.

Figure 23.2. Still for Animation 1. Audio: Register at the DMV…

Figure 23.3. Still for Animation 1. Audio: …or online at registerme.org…

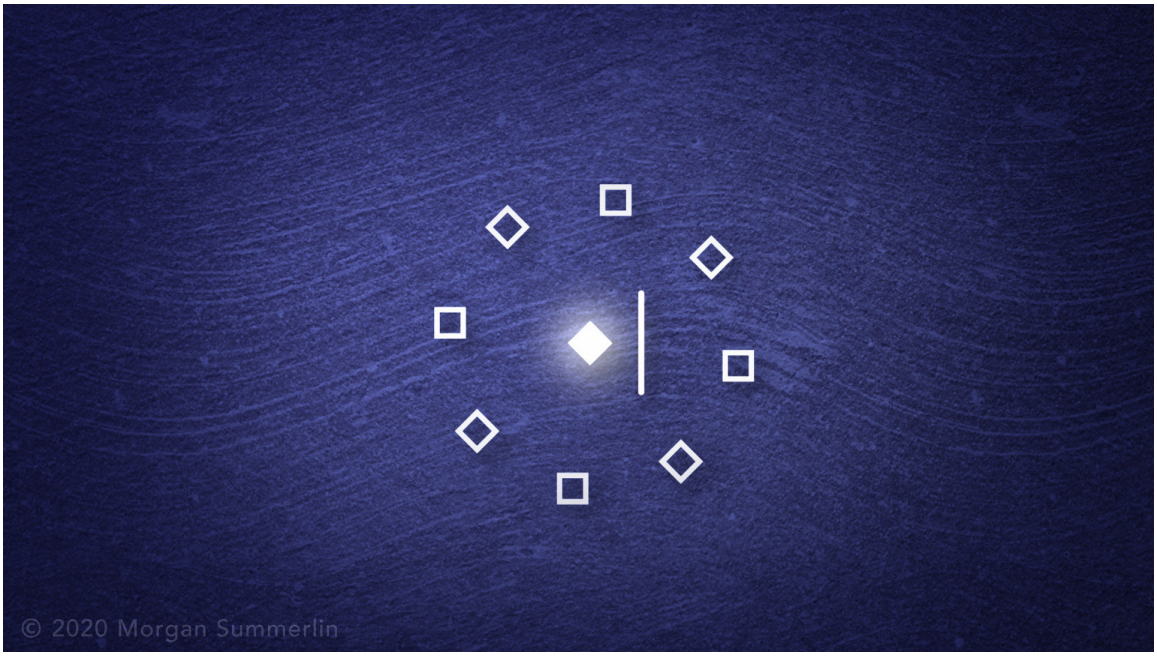

Figure 23.4. Still for Animation 1. Audio: …and talk to your friends and family to make your decision about organ donation known.

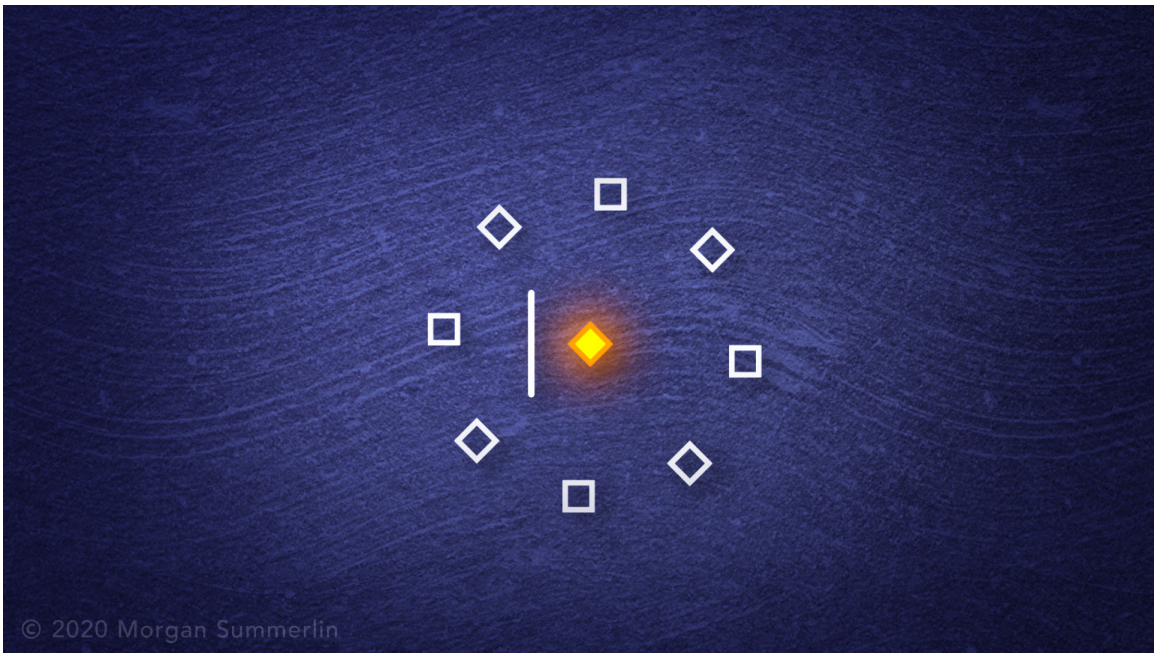

Figure 23.5. Still for Animation 1. Audio: You do not have to disclose your HIV status in order to register.

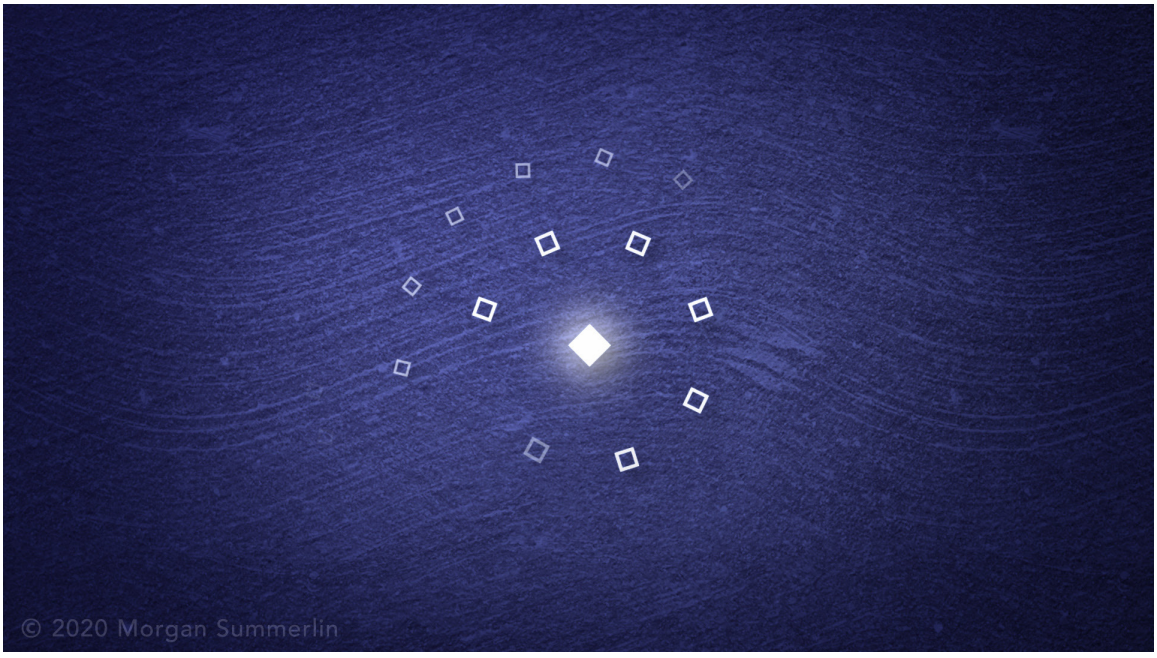

Figure 23.6. Still for Animation 1. Audio: We also ask that you help raise awareness of the importance of organ donation in the community of people living with HIV…

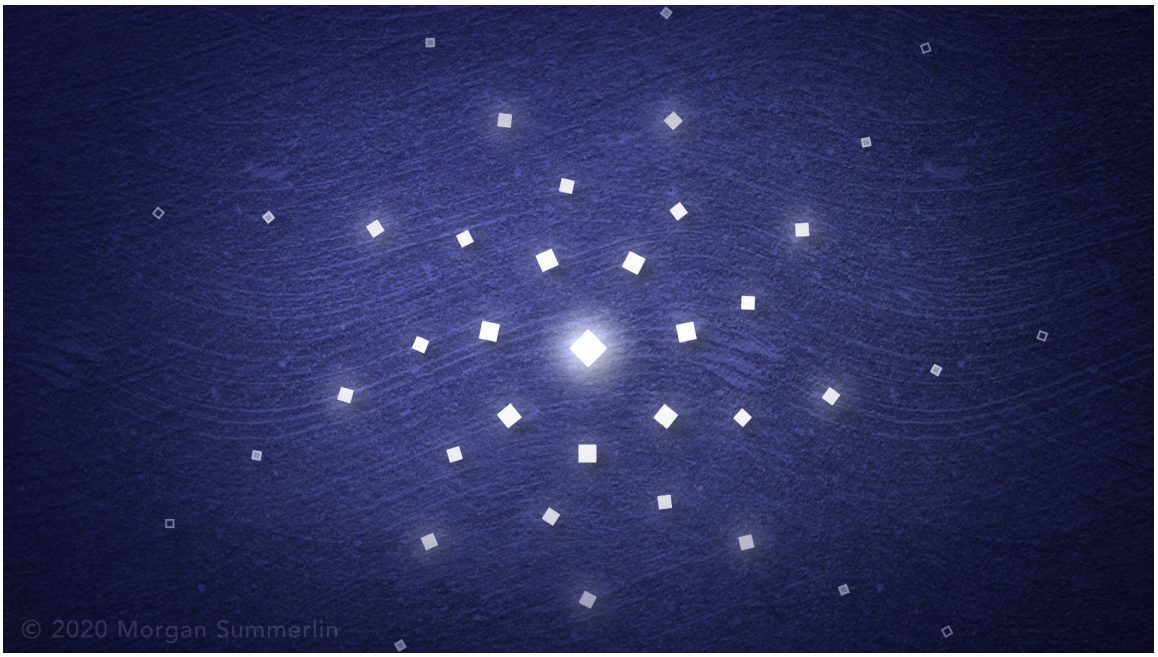

Figure 23.7. Still for Animation 1. Audio: … to continue these life saving transplants.

Figure 23.8. Still for Animation 1. Credit screen.

Call-to-Action Clip for Animation 2:

Nurses at hospitals with trauma centers and OPO representatives

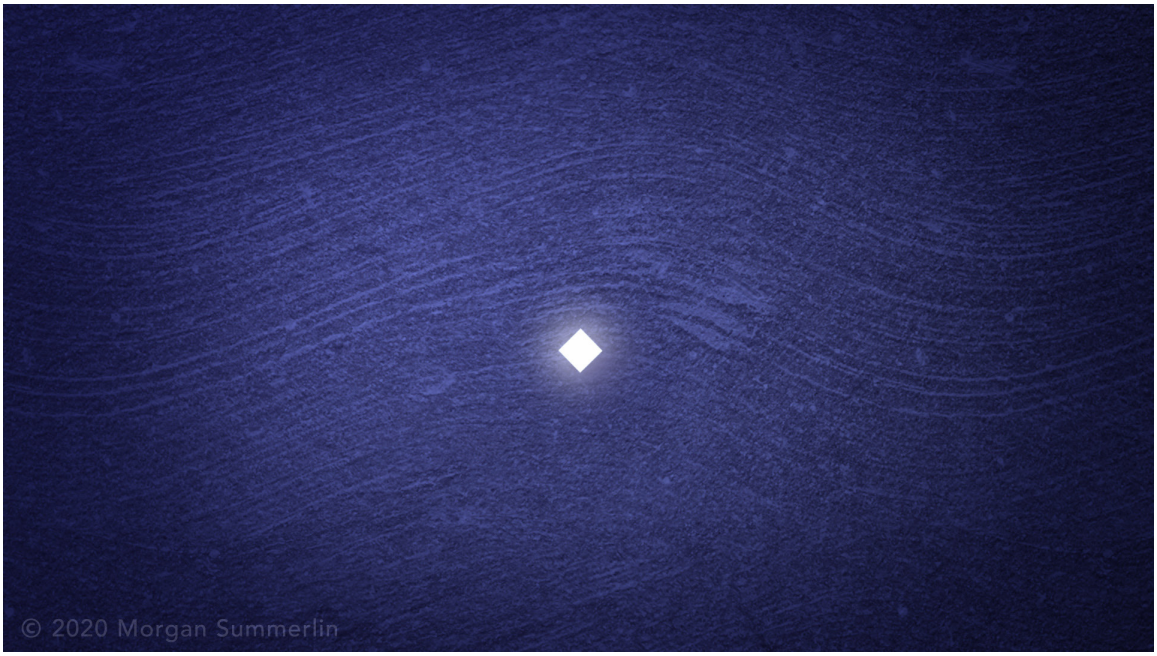

Figure 24.1. Still for Animation 2. Audio: When referring a patient for organ donation…

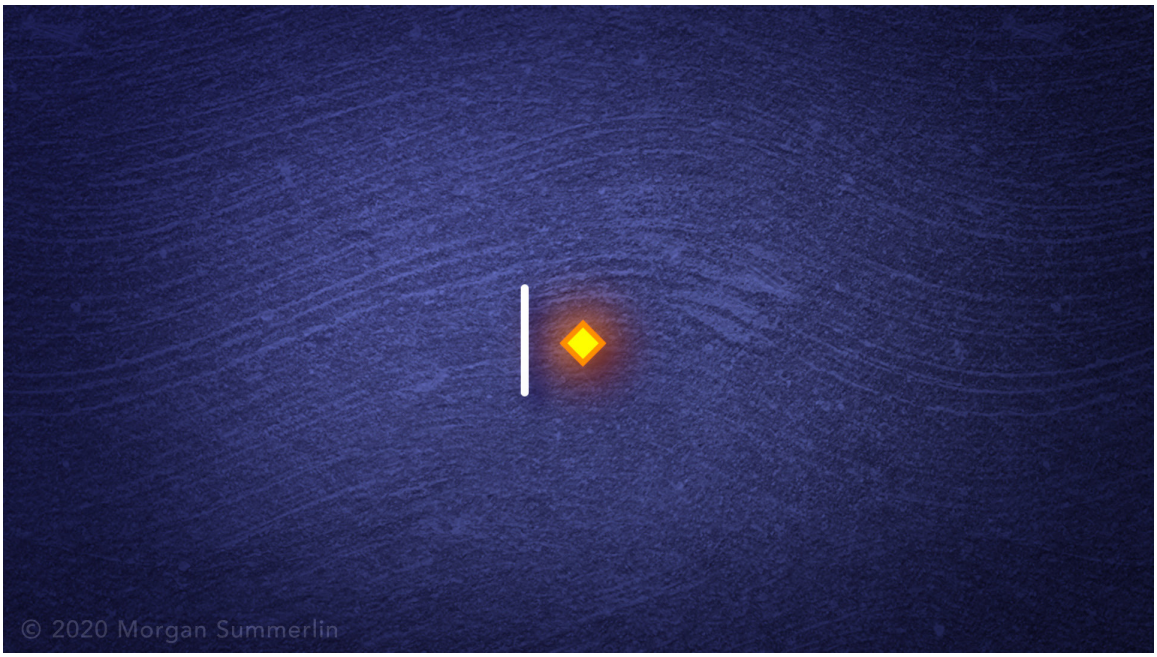

Figure 24.2. Still for Animation 2. Audio: …HIV status should not change your perception of your patient's potential to save lives.

Figure 24.3. Still for Animation 2. Audio: Patients can be newly diagnosed with HIV…

Figure 24.4. Still for Animation 2. Audio: …in care for HIV…

Figure 24.5. Still for Animation 2. Audio: …or potentially HIV-positive pending serological testing.

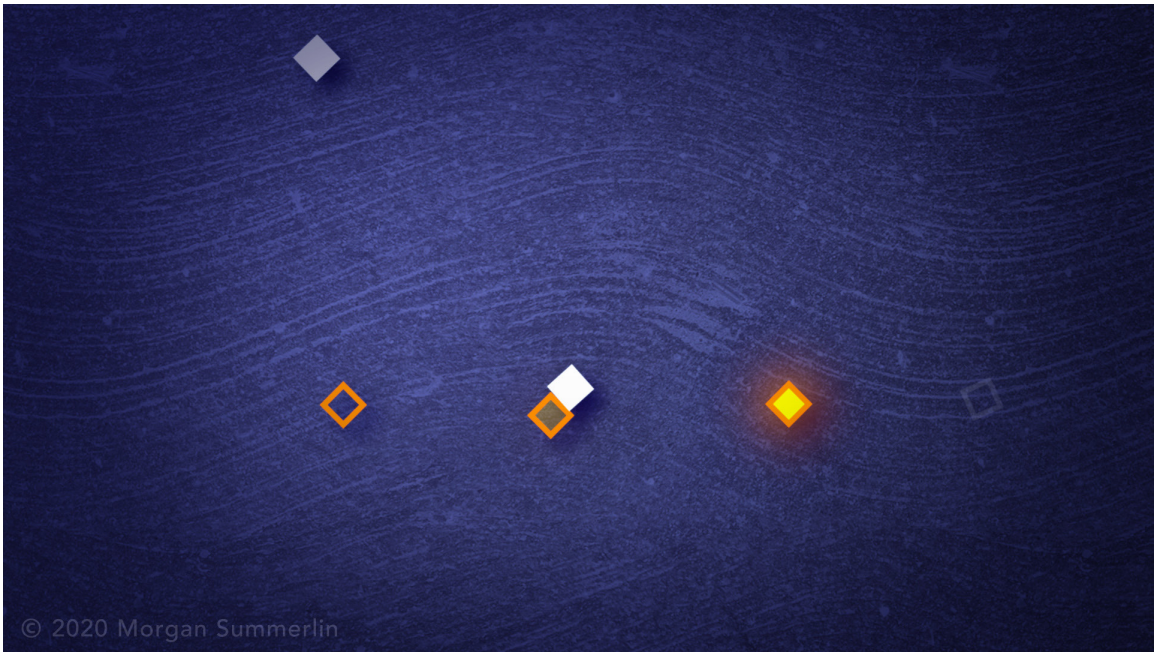

Figure 24.6. Still for Animation 2. Audio: Even if a patient has never been in care for HIV, they still have the potential to save lives.

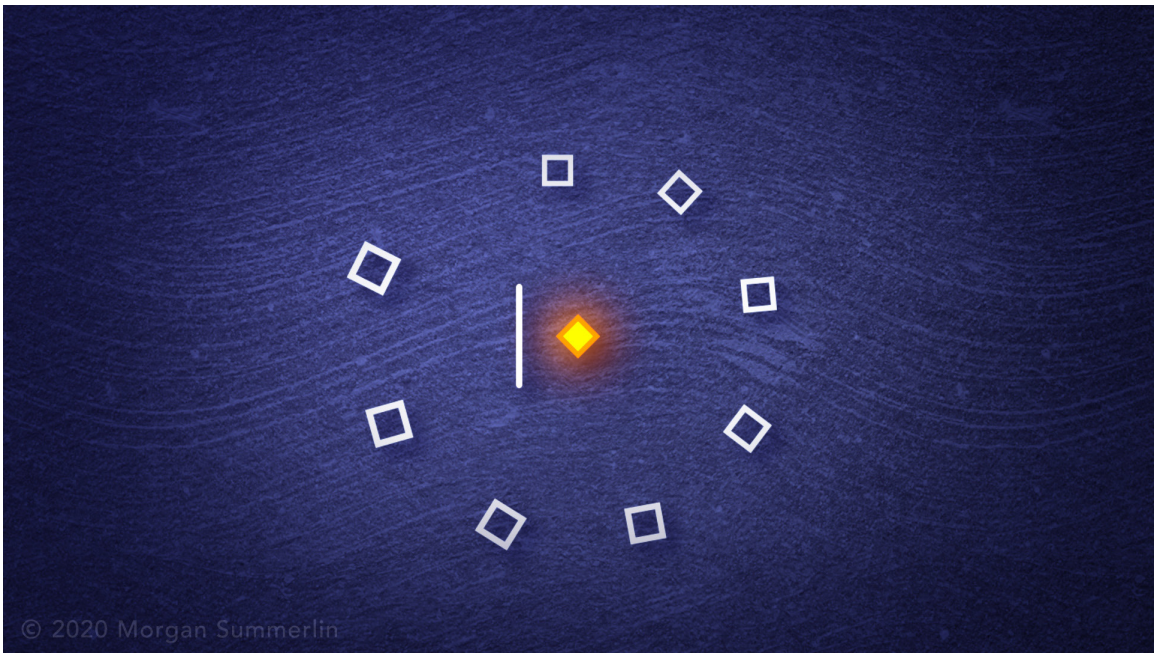

Figure 24.7. Still for Animation 2. Audio: The HOPE Act does not require disclosure of HIV status to the patients' families…

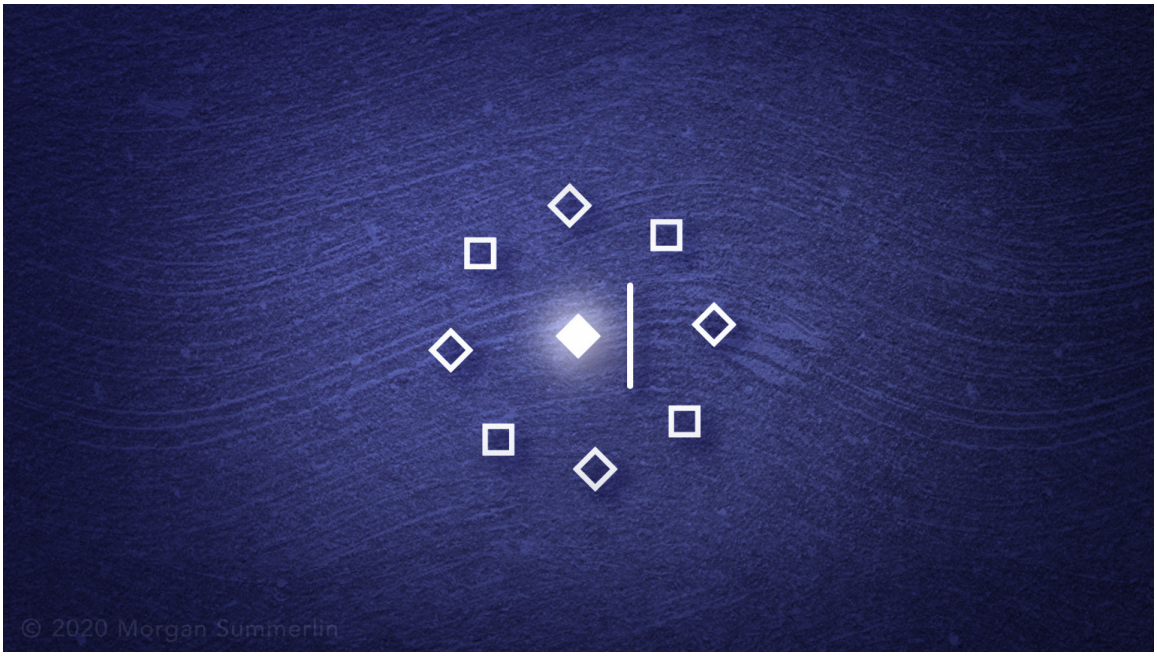

Figure 24.8. Still for Animation 2. Audio: …in order to be an organ donor.

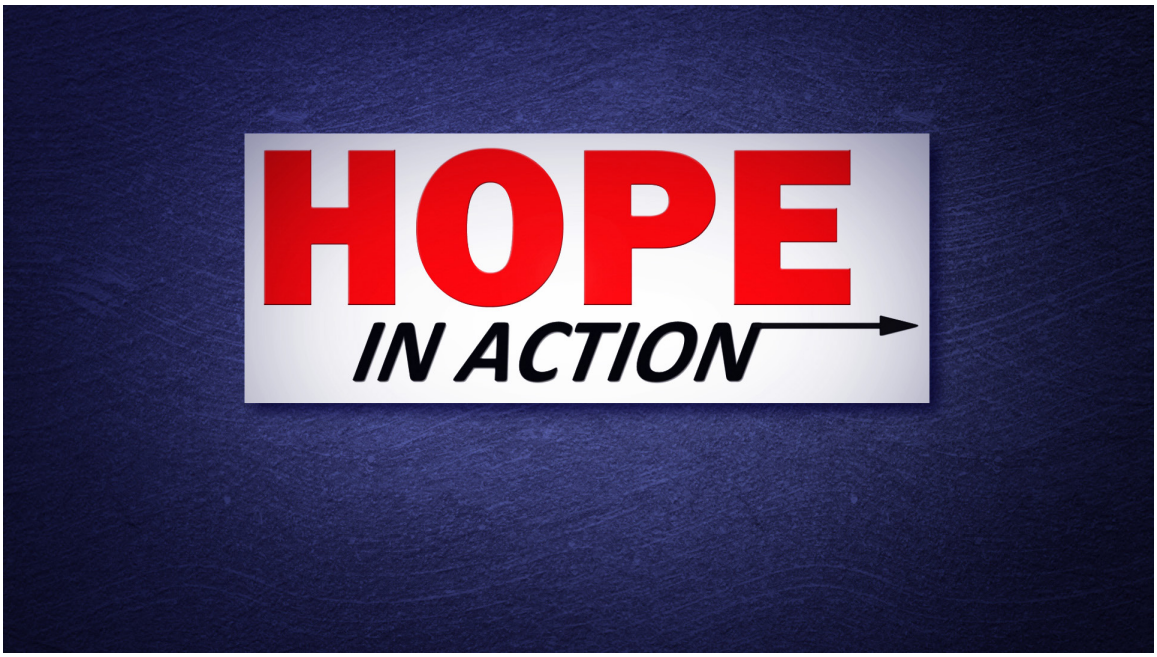

Figure 24.9. Still for Animation 2. Audio: When an OPO receives a call about a potential donor with HIV, they can contact the HOPE in Action study at Johns Hopkins, for assistance with…

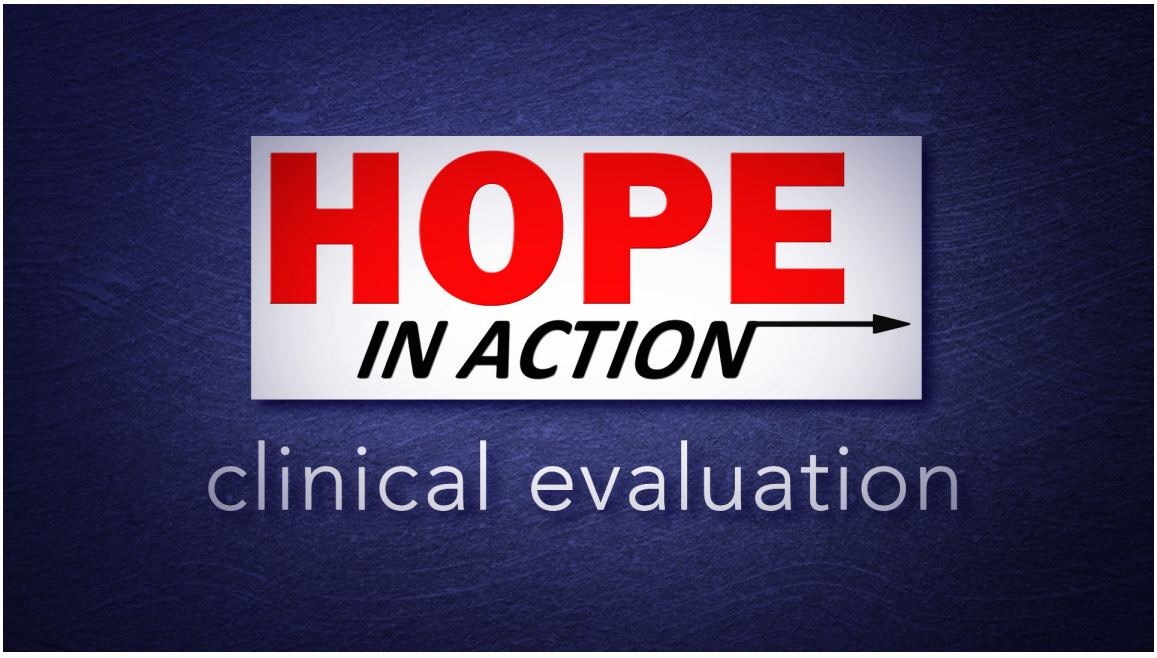

Figure 24.10. Still for Animation 2. Audio: …clinical evaluation, approach, and organ allocation.

Figure 24.11. Still for Animation 2. Credit screen.

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Vita

Morgan N. Summerlin was born in Charlotte, North Carolina and raised in Clemson, South Carolina. Growing up with an artistic and outdoorsy family and a love for science, she discovered the profession of medical and biological illustration in middle school. While also creating custom frames and portraits in an art studio she shared with her mother, Morgan continued her education at Clemson University with a major in Biological Sciences and a minor in Art. During her undergraduate studies, she immersed herself in scientific research and created educational illustrations for peer-reviewed publications. Under the guidance of Dr. John Morse, Professor Emeritus of Entomology at Clemson University, and with the support of a Research Experience for Undergraduates Grant, she created habitus illustrations for the "Atlas of Common Freshwater Macroinvertebrates of Eastern North America", a novel and comprehensive online training tool for aquatic insect education and identification.

In August 2018, Morgan matriculated into the Medical and Biological Illustration graduate program in the Department of Art as Applied to Medicine at Johns Hopkins University School of Medicine. Here she learned to communicate complex scientific information through engaging storytelling techniques in a variety of digital and traditional media. During her first year of graduate studies, Morgan was awarded the Association of Medical Illustrators Award of Excellence for her anatomical plate illustration, "Pathways of the Greater Petrosal Nerve". In her future endeavors, she plans to use her rigorous science and art training to create compelling and accurate visual media that instill a better understanding of the scientific world around us. Morgan is currently a candidate to receive a Master of Arts in Medical and Biological Illustration in May of 2020.